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OCTOBER 1984

95p No. 3



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UNDER REVIEW

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Extended Basics compared
A complete comparative review of *all* the extended Basics available on the 64. We compare features, documentation, ease of use and value for money in this comprehensive buyers' guide.



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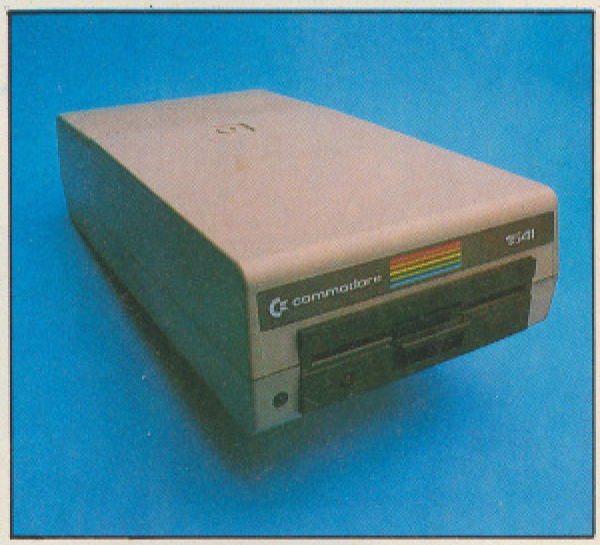
Valhalla
Launched with a fanfare of trumpets, *Andy Holderness* wonders whether it stands the test of time.

40

KoalaPad
Draw, edit and save pictures just by touching a stylus to a bitpad. But is it as easy as it seems? *Henry Budgett* finds out.



FEATURES

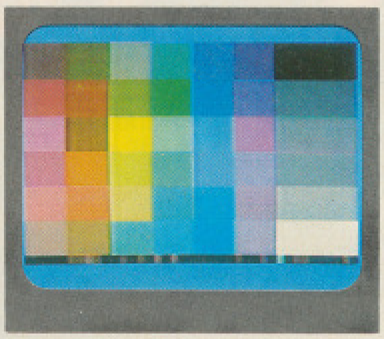


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Reader Survey
Your chance to tell us what we're doing right and what we're doing wrong! Your answers could win you a disk drive plus £300 worth of books and software.

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Machine code tutor (part 2)
This month, *Andrew Bennett* examines assemblers. What to look for, what the features mean and mini-reviews of six popular packages.



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New Resolutions
Fed up with being limited to eight screen colours? *Keith Bowden* shows how you can have no less than fifty using nothing more than a little ingenious colour-mixing.

CORE MATERIAL

Open Access **Page 3**

Buzzwords
Is Cuthbert going down the tubes? Is CDS for the high jump? *Ron Smith*'s the man with the answers. **Page 4**

Project
Y64 invites its readers to put their heads together to come up with an unbreakable encryption technique. **Page 11**

Soft Stack
Check out the latest business and utility packages in our monthly summary of new releases **Page 12**

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Mike Liardet invites you to put his hamsters to bed... **Page 14**

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The charts you *know* are accurate because *you* wrote them! **Page 16**

Missives
Immortal miners, a plea against piracy, the Zork rescue service and one man's view on where we've got it wrong and how to get it right! You tell it to us like it is ... **Page 18**

Action Replay
Wimbledon 64, Football Manager, Decathlon... *Ken T Clark* in sporting mood as he sorts through the latest games releases to find the good, the bad and the ugly. **Page 48**

Scratchpad
A one-line cure for LOAD ERRORs, an interrupt-driven alarm clock, a numbered RESTORE statement and an alternative GET statement. *Y64*'s utility workshop. **Page 59**

Keyboard Kapers
It may be six pages long, but if you're into music we guarantee you won't regret typing it in! Music Assembler/Editor has to be heard to be believed. **Page 63**

Talkin' 64
What kind of software house calls itself Talent and talks a university into backing it? **Page 80**

THANKS
Y64 wishes to thank 'Tomorrow's World Today' (of Oxford Street) and 'Pilot Software City' (of Rathbone Place) for the kind loan of hardware and software used in this magazine. We hope that Pilot enjoyed the drinks....

TAKE NOTE
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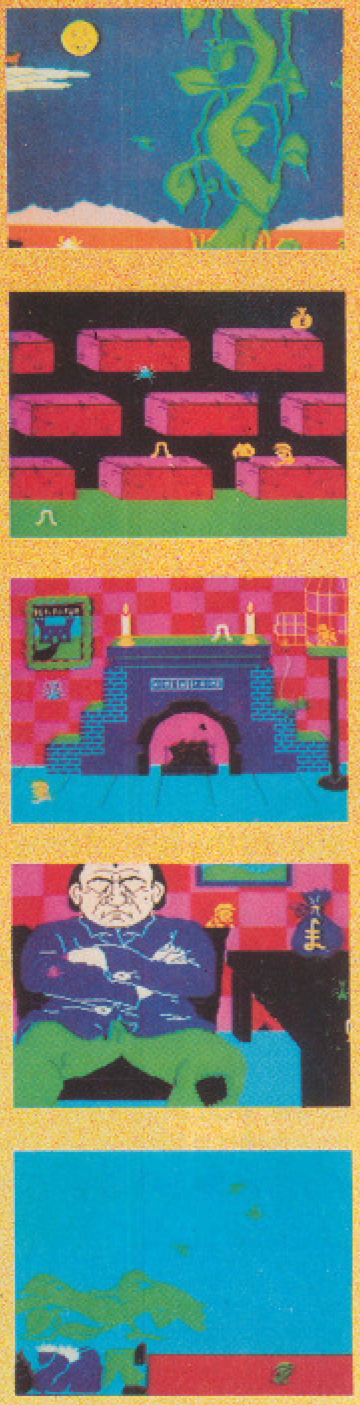
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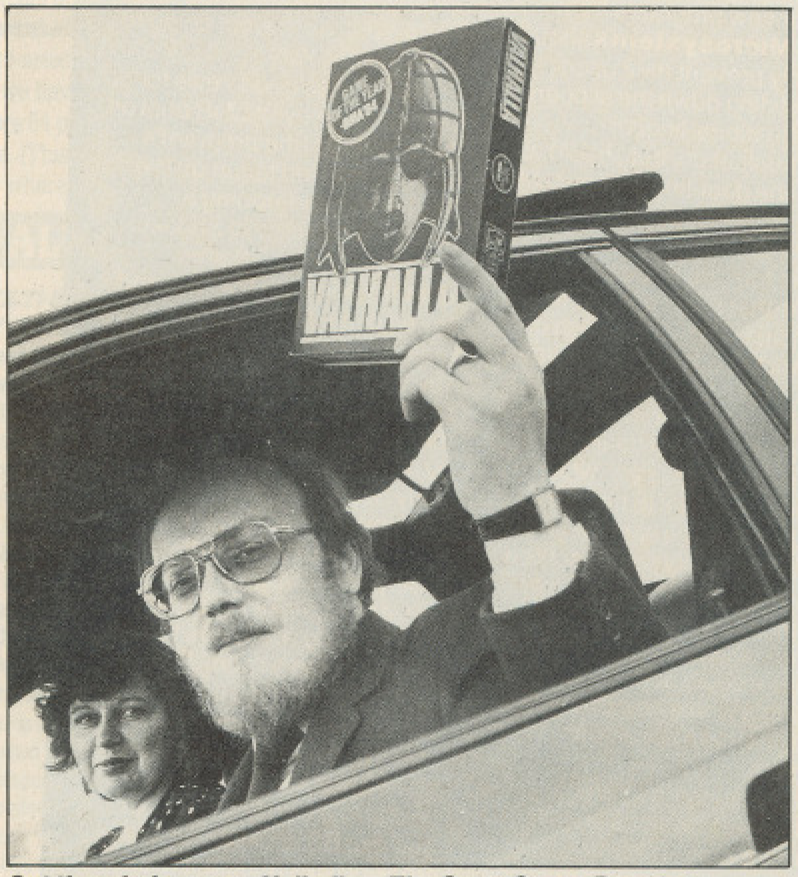
The Other Space Race . . .

Legend Software claims to have spent £1/4 million pounds on developing its successor to Valhalla (see page 34), *The Great Space Race*! This is reputedly the largest amount ever spent on the development of a single computer game.

Based on an improved version of the Movisoft system used for Valhalla, The Great Space Race is said to offer technical effects never before seen in home computer software — a claim not dissimilar to that made by the now defunct Imagine Software when referring to its MegaGames. Legend director John Peel says TGSR will offer "the most realistic and spectacular pictures ever" — including animated facial expressions on the characters! Peel also reckons to have achieved true solid 3D graphics.

The game itself is in two parts. In the first, you have to kit yourself out with the fastest space ships, the best crew and the most deadly weaponry. Having done this, you then enter the second stage — the race itself: a race in which anything goes.

The Great Space Race is expected to be in the shops by the time you read this, or you can order one from Legend on 01-524 8324/5.



Out the window goes Valhalla — The Great Space Race is here.

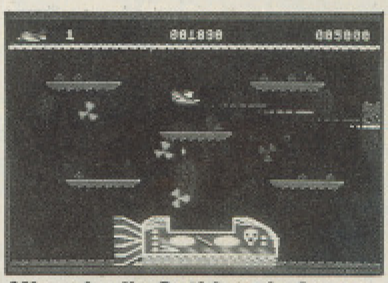
The Pitfalls of Piracy

Software house Microdeal has withdrawn all copies of *Cuthbert in the Jungle* after Activision threatened to sue. Activision planned to take Microdeal to court, alleging that the latest *Cuthbert* program was a direct copy of its *Pitfall*, upon which Microdeal backed down before the case went to court, leaving everyone to draw their own conclusions... .

As well as being forced to withdraw the game, it seems likely that Microdeal paid substantial damages to Activision. Activision would neither confirm nor deny this, but spokeswoman Jacky Cahn made it clear that the company considered Microdeal's behaviour to be positively piratic.

It looks as though Microdeal's making something of a name for itself in the 'clone' market, *Cuthbert in Space* (reviewed last month) bearing an uncanny resemblance to Ultimate's *Jetpac*. Ultimate wasn't aware of the program when *Y64* phoned, but is looking into the matter and will consider whether *Cuthbert* is similiar enough to warrant placing the matter into the hands of its lawyers.

Microdeal's managing director John Symes refused to comment.

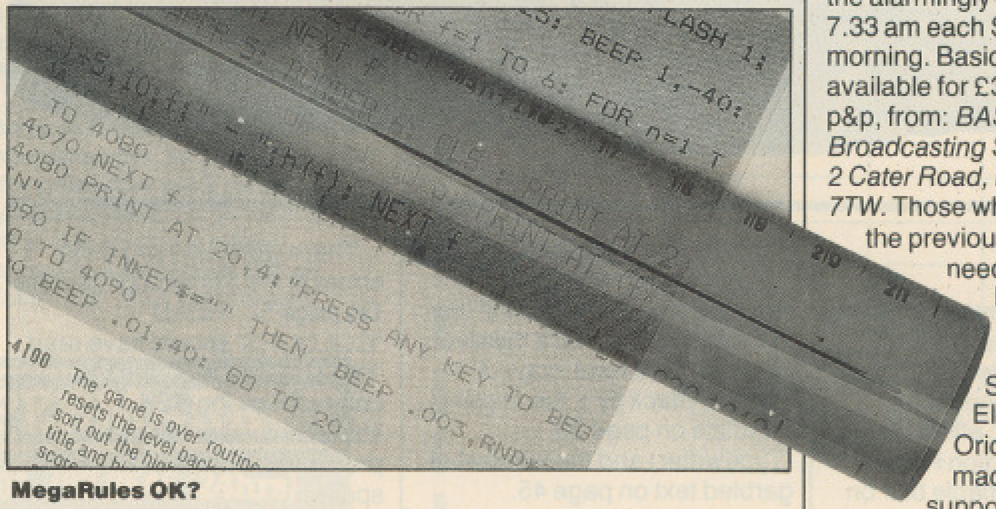


Microdeal's *Cuthbert in Space* — a Jetpac clone?

Dealer Deals Rule Out Listings

You've heard of MegaGames, now meet the MegaRule! Made of transparent perspex, the rule is designed to be placed over program listings. The ruler magnifies by 100%, and also has a guide line so that you know where you've got to.

The MegaRule costs £2.99, and is available from Dealer Deals on 01-930 1612.



MegaRules OK?

Chip Shop Announces Bigger Helpings

BBC Radio's computer series *The Chip Shop* is to be broadcast on Radio 1 as well as Radio 4. The last series of the weekly radio programme was primarily centred on Basicode broadcasts — a kind of computer Esperanto that can be recorded and loaded into a variety of machines including the 64. The new series are intended to appeal to a wider audience, the Radio 4 broadcasts including hardware and software reviews, and the Radio 1 series broadcasting Basicode software.

Basicode was produced by the Dutch broadcasting authority, NOS, in the late '70s. The system works by presenting a subset of Basic which is supported by a large number of machines, and built-in subroutines to take care of cases where identical facilities are supported by all machines, but with differing syntaxes. Basicode programs are then saved to tape in a special format which can then be loaded by other machines. NOS broadcast computer programs in Basicode, and these were successfully recorded and loaded by owners of all the machines supported.

An improved system, known as Basicode-2, was used by the BBC in its own broadcasts, and a new release — Basicode-2+ — has just been released bringing the total number of machines supported to 19.

The new Radio 4 series began on the 15th September, and is broadcast every Saturday at 4.15 pm. The Radio 1 version will start on the 29th September, and will go out at the alarmingly early hour of 7.33 am each Saturday morning. Basicode-2+ kits are available for £3.95, inclusive of p&p, from: *BASICODE-2+, Broadcasting Support Services, 2 Cater Road, Bristol BS13 7TW.* Those who already have the previous Basicode-2 kits need not send for Basicode-2+; the new version simply adds the Spectrum, MSX, Electron, Dragon, Oric and Atmos to the machines already supported.



BUZZWORDS

Returning from his previous exploits — in the jungle, on walkabout, and so on — **Microdeal**'s Cuthbert will soon not so much be going down the tubes as messing about inside them; for that's where our wandering hero will encounter any number of hazards on his way through the 210 screens.

Called *Cuthbert in the Tubes*, the idea is to assist our idiotic supertwit first to enter, and then to find his way out of, the labyrinthine underground pipes. However, as he begins to tread this treacherous path, Cuthy is surprised by hungry-looking ghosts whose mouths open and close (presumably in eager anticipation of the feast which has just appeared), not to mention the dastardly saxophones.

Anyway, each new screen is another room and you'll have to find a key to unlock the door before moving on to the next one; that's where the skill comes in, because there's a mini arcade game lurking inside each room. And it won't be just ghosts and saxophones ... you'll need to keep a sharp eye open for the snakes, too.

Says Microdeal's Mrs Pope, "There are several difficulty levels, and it's quite challenging to play, but well worth the effort." With a release date of around late September or early October, it shouldn't be long before you're hitting the tube groove.

Four new programs from **CDS Microsystems** should not only prevent their users from sliding down the slippery slope to mono-lingual communication, but should also ease the daunting prospect of trying to learn another language.

The four are all part of a series that's designed to teach French, German, Spanish or Italian, though not via the usual textual exercises. Says CDS's Giles Hunter, "Commodore are hoping to include their digital speech synthesiser," which will enable the pupil to hear the language at the same time as it's being displayed on screen. But with speech synthesisers tending to drone on monotonously, who knows, this feature could conceivably give rise to a whole new problem — Europe-man speak with chipp'd tongue.

Unfortunately, the final (talkative) versions are still just an allophone in some Commodore programmer's ear, so release dates have still to be announced.

Ever busy, CDS is currently working too on a show-jumping simulation; the player takes the part of a rider whose aim is to complete a round over the hurdles and finish in the fastest time. As he (or she) canters round, so the player gets a 3D, real-time view of the background and arena; plus there'll be a small map at the top of the screen that tells riders the exact course to follow. Once a round has been timed and the number of faults recorded other players can try to better your performance.

According to Giles, CDS would dearly love one of the famous jumpers to endorse its program — hardly surprising considering the boost it could give to profits. Of course, Harvey Smith is an obvious choice, but can they expect a fistful of dollars or just two fingers in reply?

Still, at the time of writing, the finished program (if it doesn't gather dust waiting for someone suitable to endorse it), was due for release at the end of August or early September, price £7.95. And, no, it's not going to be called *OK Yah!*

There's also good news for those who enjoyed CDS pool on the Spectrum; the program's being converted to run on the 64. It's also undergoing a metamorphosis — to Snooker. "It's ultra life-like," claims Hunter, "and both the spin and speed of the balls are very realistic." It'll be interesting to see the CDS solution to green ball on green baize. Anyway, this too should be out and about by around the end of August or early September, for £7.95.

Three new games are on the way from **Bubble Bus**, all with widely differing themes. The first, called *Strike Force*, is a 3D arcade-style war game that's set around an airport. The player will have to sit behind an anti-aircraft gun, firing double shells at the various 'enemy' planes that fly by. There's probably a bit more to it than that, but BB spokesman Mike Meaking was reluctant to say more.

Then there's *Cave Fighter*, which will have you helping a warrior to swing across the caverns via ropes; below, of course, will be the assorted monsters that wait patiently for any slip. As each hurdle is successfully overcome, so the screen scrolls from side to side — until, eventually, our Tarzanesque hero reaches the end of the assault course.

More promising, perhaps, is a little number codenamed *Insects' Revenge*. It's set in the garden of programmer Nick Strange (where else?) and features a shrunken figure who's only two inches tall. The little runt will have to survive just about anything that might lurk under stones, in the rockery or amidst the uncut grass. Hazards will range from slugs and insects, through to the deadly lawnmower; you'll have to look out to avoid decapitation.

All three programs should be available some time in the autumn, priced at £6.99 each.

4

Whoops!

Thanks to a printers' error, most of the colour pages in issue 2 were actually printed in glorious black and white! This had a particularly drastic effect on the screen shots in Action Replay (yes, that unidentifiable blur on page 39 was a screen shot ...).

A printing error was also responsible for the missing line in Derek Hutchinson's missive on page 17 (it read 'copy of *Harrier Attack* by'), the missing headline on page 23 (Typewriter) and the somewhat garbled text on page 45.

There were also two minor errors in the Sprite Logo feature On page 52, 'READ "COLOURS' should have read 'READ "COLORS' and the colons following ASK statements should have a preceding, but not a following, space.

Play it again, CBM

Those with a musical bent will appreciate Microsound 64, a four-octave musical keyboard from Autographics. Interfaced to your 64, it provides you with a fully-fledged synthesiser.

The keyboard, which plugs into the 64's user port, is supplied with software which displays the current status of the synthesiser, and allows it to be controlled from the 64 using single-key commands.

Sound out Autographics on 0730-87403.

Bargain of the Century

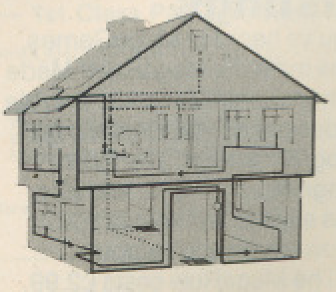
It seems to be slowly dawning on software houses that the reason their sales are dwindling might have something to do with the fact that they charge a tenner a game. Century City will be making its entry into the 64 market with a series of four £1.99 games. Already available for the Spectrum, *Laser Lord, Man Trap, Sentinels* and *Kamikaze Collector* will be converted for the 64 shortly. Release dates are not known at the time of writing, but you can ask Century on 0384-57077.

Sounds alarming

Security-conscious Commodore owners can now protect their homes with a Sentinel burglar-alarm system from Micro-Security.

A complete kit of relay interface (similar to VIC-REL, reviewed last month), software, 88 decibel alarm bell, contact switches, pressure mat and cabling costs £99. The relay box and software alone cost £69.

The software is menu-driven, and allows user-defined parameters to be saved to disk or tape. Micro-Security is also working on adaptors to allow the system to control other household equipment. Make contact by writing to Micro-Security at PO Box 18, Havant, Hants, PO9 3LB.



The complete DIY kit as installed in a 3-bedroom house.

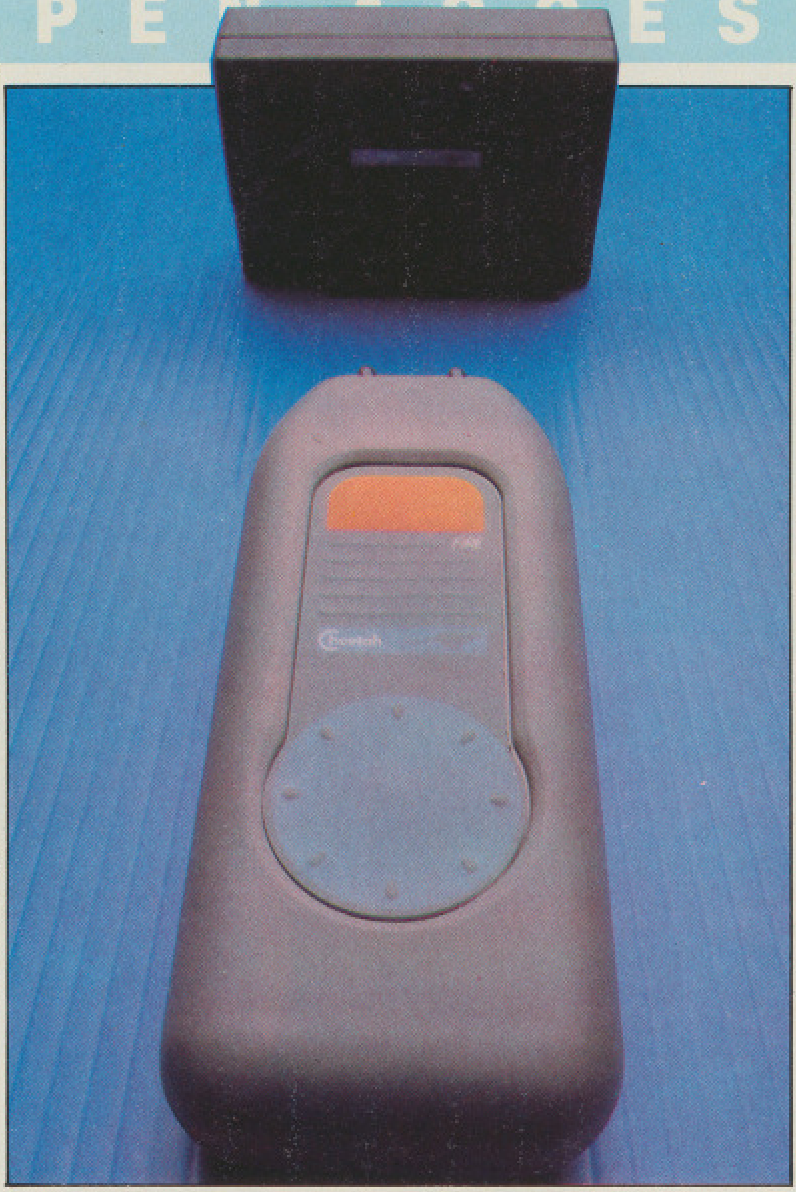
Enter the RAT

First we had mice, now we have the RAT. Looking like a cross between a tv remote control unit and a phaser, Cheetah's Remote Action Transmitter is actually an infra-red joystick.

The receiver, nothing more than an infra-red detector, simply plugs into the 64's joystick port and will be compatible with all joystick-based software. The RAT itself contains two transmitters, to ensure that there is no loss of signal as the device is moved around, and is powered by a 9v PP3 battery. Cheetah claims that the RAT has a range of up to 10m, which does appear to be justified.

The RAT is controlled by a touch-sensitive panel — something I found unsuitable for fast-action arcade games, though I suppose this is simply a matter of personal taste. The bad news for everyone, though, is that the RAT will set you back £29.95 — a hefty price for a joystick.

The RAT has already been released for the Spectrum at the time of writing, and is expected to be available for the 64 sometime in October. Further details from Cheetah on 01-833-4733.



An expensive rodent — the £30 Cheetah RAT.

The Great American Gold Rush

Two new companies have been set up for the sole purpose of producing US software in Britain under licence. US Gold, the result of a merger between Centre Soft and Ocean Software, will be importing titles like *Zaxxon* and *Bruce Lee* from ten US software houses, while Statesoft has just launched *Flip & Flop* and *Astro Chase* from First Star Software.

American software has always been expensive for individuals to import due to a combination of a poor sterling-dollar exchange rate and often hefty import duties. By producing the games in Britain, US Gold can sell games like Zaxxon for £10 instead of around the £30 mark.

Stop Press!

The Blandford Board, a 24-hour TBBS bulletin board, now has a 64 SIG run jointly by the sysop and *Y64*. Messages can be left both to *Your 64* and to other 64 users, and we hope shortly to enable you to download *Keyboard Kapers* and longer *Scratchpad* listings to save those of you with modems the trouble of typing them in.

We are currently working on a *Y64* Smart Terminal program which will support downloading of 64 software. This will be published in a future issue. The Blandford Board is 300-baud (8 data-bits, 1 stop, no parity) on 0258-54494.

More Rodents

Cartoon rodent Danger Mouse is to star in a series of computer games from Creative Sparks. *Danger Mouse* in *Double Trouble* should be available by the time you read this, with *DM in the Black Forest Chateaux* — an adventure — expected shortly. It's not known whether the games are compatible with Cheetah's RAT . . .

Other CS releases include *Countdown to Meltdown*, a charming little game in which you have to prevent a nuclear power plant from doing a China Syndrome, and *Macbeth* — a four-program adventure based on Shakespeare's tragedy. Macbeth costs £14.95, the others £7.95. Creative Sparks are on 0252-543333.

Making Pirates See RED

Abacus subsidiary Rising Edge Data claims to have devised a foolproof anti-piracy system — not a new claim, and probably not an accurate one.

The RED card system involves a simple magnetic card reader, not unlike those used in bank cardcash systems. Programs will be supplied with a specially coded card, this card being needed to allow the game to be RUN. It offers an advantage over traditional hardware dongle systems in that the cards are cheap to produce, though RED doesn't explain how the readers will be distributed.

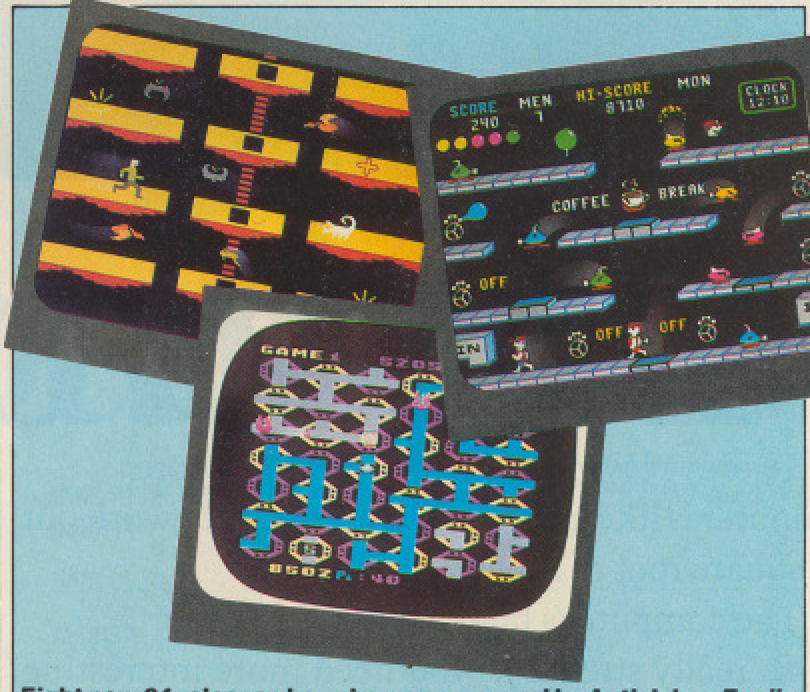
Like most dongles, though, at least RED allows the user to make as many backup copies as desired . RED is on 0792-799193.



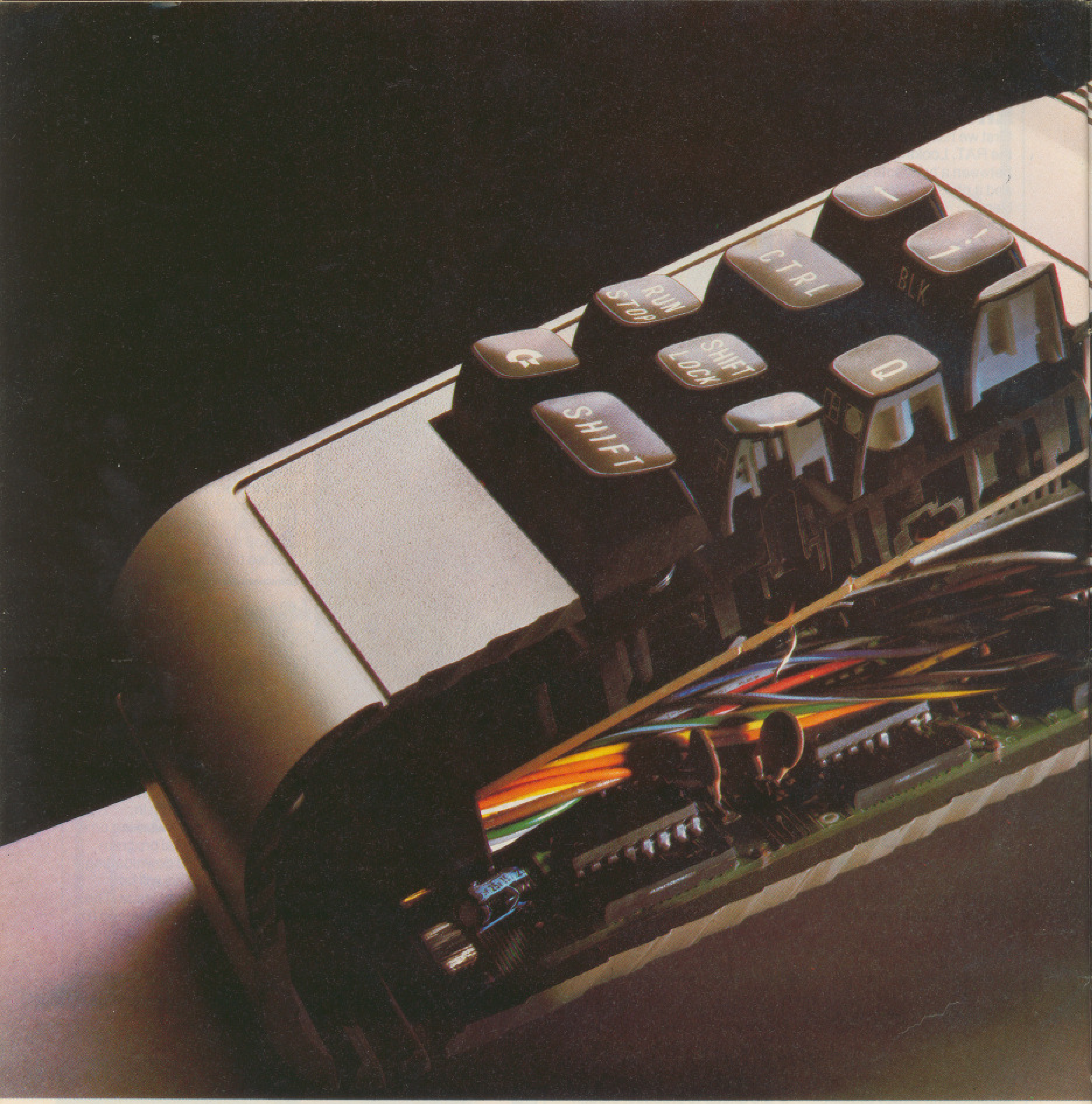
The Interpod: reduced to £59.95

Cheaper by Cheetah

Cheetah has cut the price of the Interpod interface to £59.95. The Interpod provides both an RS232 and IEEE interface, enabling the 64 to be connected to a wide range of parallel devices — including the CBM 4040 disk drive. Details from Cheetah on 01-833-4909.



Eight new 64 releases have been announced by Activision. *Zenji, Pitfall II, Toy Bizarre, River Raid, Space Shuttle* and *The Designer's Pencil* are all available on cassette, while the latter three plus *Decathlon* and *Beamrider* are supplied on disk. The cassettes will be priced at £9.99, and the disks between £15 and £20. You can talk to Activision on 0628-75171.



Are you only using

To only play games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

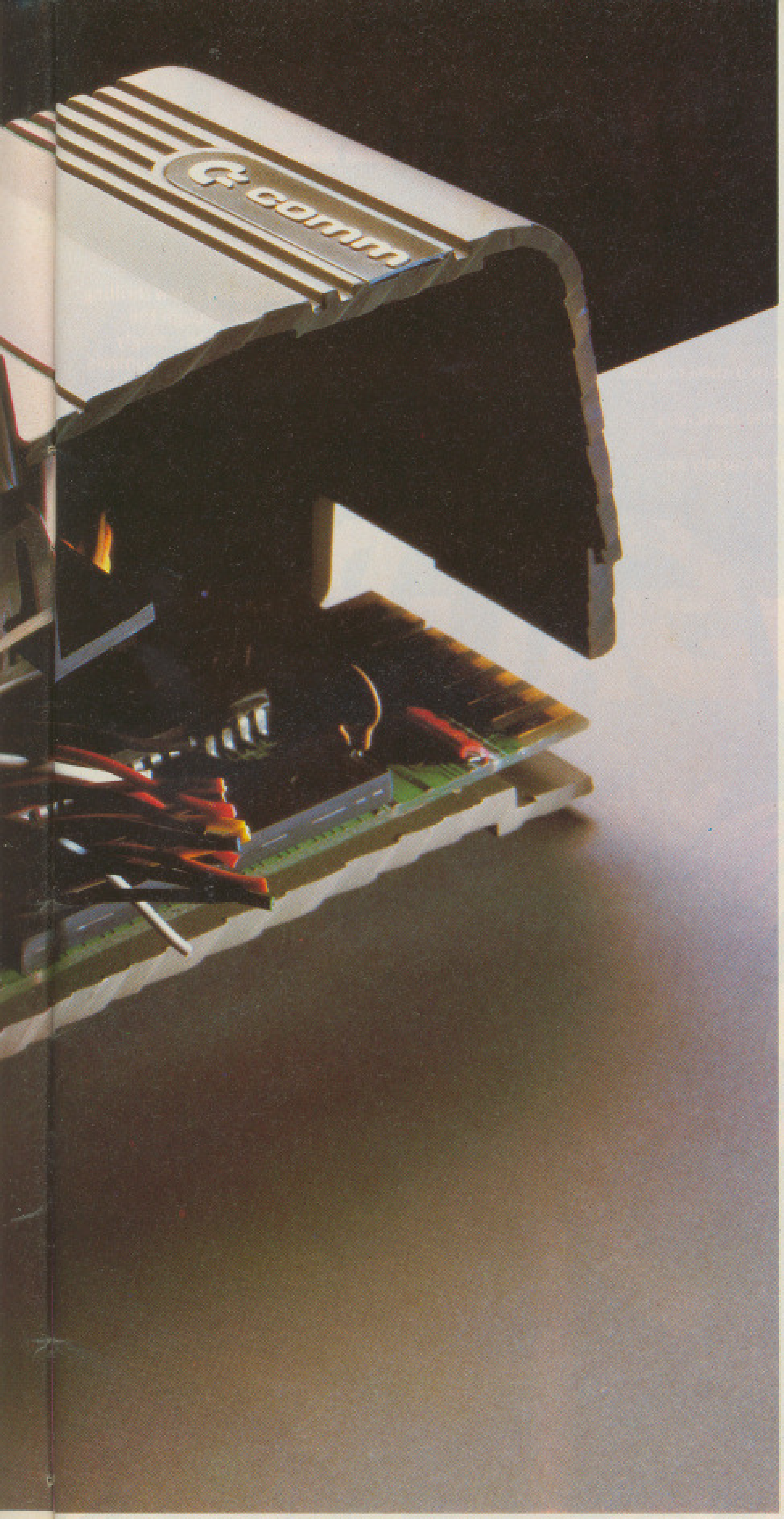
To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

And for those you need peripherals.

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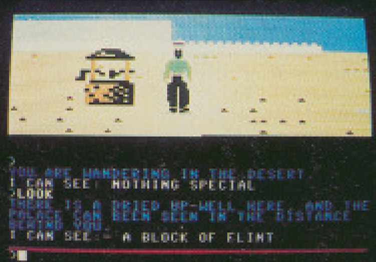
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Draw your sword and prepare to meet your fate!

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ACCESS

Robot Shop

Britain's first specialist robot shop opened in London in September. Among the robots on show are the Beastie, a robot arm for the 64, and EV1, a solid state robot eye, also for the CBM.

The Robot Workshop was founded by Gordon Ashbee, the man who set up Britain's first specialist computer shop, *The Computer Workshop*. Ashbee is keen to hear from all robot designers, both professional and amateurs working from their kitchen! He will offer free display space to any robot, whether the device is a mass-produced commercial product, or a one-off experiment built by a hobbyist.

The shop is situated at 121 Ifield Road, London SW10 (Tel 01-373 8571).

PROJECT 64

Y64 will be setting regular projects and inviting you to submit suggestions and ideas. We'll then use your comments to build up the idea over several issues before ending up with a finished project.

Project 1 is more of an interesting exercise than a directly useful application; Project 2 — which we'll start looking at next month — will be more practical: to design and program a wordprocessor! We'll ask you to let us know what features you think it should include, and how you think we might tackle them. We'll then set a programmer onto putting the whole thing together.

Project 1: Encryption

Encryption is the technique of converting text into coded form. This isn't only of interest to the CIA and other centres of governmental paranoia; where computers are concerned, encryption has a number of very practical uses. These range from compressing large amounts of text into a small amount of RAM (see *Puzzlepoint*) through puzzles to adventure games in which the text needs to be hidden from the user (*Y64*, issue 2).

In this project, however, we're going to concentrate on designing a *secure* encryption technique — it doesn't have to be memory efficient (though it shouldn't be *too* wasteful!). What we'd like you to do is to come up with suggestions for possible approaches to the problem. We'll then examine these in following issues.

The simplest form of encryption is to simply 'shift' the alphabet left or right (or, in computing terms, add to or subtract from the ASCII code). Thus the following program would do the trick:

```
100 REM Mega-simple encryption
    technique
110 PRINT "Enter message: "
120 INPUT M$
130 INPUT "Coding factor";C
140 FOR A=1 TO LEN(M$)
150    C$=C$+(CHR$(C+(ASC
       (MID$(M$,A,1)))
160    NEXT A
170 PRINT "The translated
    message is: "
180 PRINT C$
190 REM To decode, enter the
    same
200 REM coding factor with a
    minus sign
```

This is, of course, ridiculously simple. If you now change line 130 to read:

```
130 C=C+1:C$=""
```

and add three new lines:

```
185 PRINT "Press any key to
    continue"
186 GET A$:IF A$="" THEN 185
187 GOTO 130
```

you then have a program which will decode any message encrypted using the technique (though we may need to subtract from, instead of adding to, C).

We're looking for something a little more sophisticated than this(!). What we'd like from you at this stage is *not* complete programs, but rather suggestions and thoughts on the possible techniques we could use. Having said this, by all means include short listings to show how the technique could be applied in Basic.

All contributions should be sent to: Y64 Project 1, 14 Rathbone Place, London W1P 1DE.

SOFT STACK

Y64's monthly roundup of new business, education and utility packages

BUSINESS

Supernews is super news (*who writes this stuff? Ed*) if you're a 64-owning newsagent. For a mere (??) £499 plus VAT, it will look after up to 3000 deliveries, produce rounds lists, accounts, pre-order requirements "and more". Latest details from Bubble Bus on 0732-355-962.

UTILITY

Everyone needs a little help from time to time. Stack's **Programmers' Aid** cartridges offer an extended Basic, fast tape operation, a cassette-based compiler and a two-pass assembler. Prices start at £25. Stack also sell a plug-in motherboard, enabling you to switch between up to four cartridges without powering down. Details on 051-933-5511.

Schizoid machine code programmers can now program their machines ... in Z80 assembler! Supersoft's **Mikro 80** cross-assembler is written in 6510 code to run on the 64, but assembles Z80 opcodes to allow you to produce object code to run on Z80 machines. The price was unknown at the time of writing, but is likely to be between £50 and £60. Supersoft is also working on a method of porting Z80 programs across to the target machine, probably using a direct cable link. Cross-assemblers for other processors may follow. Further details on 01-861-1166.

Designer 64 is a graphic art package primarily aimed at planners and designers. Since it uses the standard 64 graphics characters, displays created using the package can be easily incorporated into Basic programs. Studio Software is on 08926-62525.

FACTORY MANAGEMENT

Factory Manager 64 is a three-module system designed to help the small business keep track of production, stock control and assemblies. The production module can supply information on the current state of a particular job, in addition to highlighting areas where there's a wastage of materials or slow movement. This can be complemented with the stock control module, which can handle up to 1000 product lines, supplying a list of products below minimum stock level, a full evaluation report and a daily list of stock movements. The assemblies option is an addition to the stock control module, and is used to supply such information as which, and how many, components are needed to make a specified number of a particular product — as well as checking stock levels to see if it's possible. **Product Management** and **Stock Control** each cost £120, while the **Assemblies Option** adds £45 to the price of **Stock Control**. More information from DMD on 0277 229379/214168/230480.

SPREADSHEET

Busicalc 2 has been developed for the 64 from Supersoft's **Busicalc** and allows a larger sheet and more functions. It now includes 25 intrinsic functions, including conditional, statistical, trigonometric, and three user-defined, making use of up to 20 levels of parentheses. Each sheet can contain up to 999 rows of 125 columns, provided the number of boxes doesn't exceed 2500. The special VU function enables up to five different parts of the sheet to be displayed simultaneously. Available for £69.95 on tape or £71 on disk, it can be obtained either through dealers, or direct from Supersoft. Phone the company on 01-861 1166.

Suitable for reporting, budgeting, stock control, modelling, forecasting and analysis, **Multiplan 64** is claimed to be one of the most powerful and easy to use spreadsheets available. The sheet can be up to 63 columns wide by 255 rows long; these are numbered, and the arrow keys can be used to move the cursor between previously defined cells. And an explanation of a feature is obtained at any time, with the display of further helpful information on request. Available on disk for either the 64 or the SX-64 at a cost of £99.95 including VAT, copies can be obtained by contacting Kobra Micro Marketing, on 01-997 6666.

LEDGER

Ssoftpurchase is a standard ledger system that maintains a comprehensive file of supplier's accounts, and which features simple delete and replace functions — as well as date-to-date display with current balance. It's available from Ssoft Computer Software (061-973 1097) price £14.95 (cassette), or £19.95 (disk).

Ssoftsales is designed as a partner for Ssoftpurchase (see under Purchase Ledger), and it maintains a file of client records. It also features delete and replace functions. Copies can be obtained from Ssoft Computer Software (061-973 1097) price £14.95 (cassette), £19.95 (disk).

STOCK CONTROL

Ssoftstock will keep a comprehensive record of all stock movements together with associated data. It allows date-to-date display of records kept over any time period. Available from Ssoft Computer Software (061-973 1097) price £14.95 (cassette), £19.95 (disk).

VAT MANAGER

Ssoftvat works out VAT liability and maintains a file of invoices, returning date-to-date display of gross, net and VAT collected. The VAT rate is set by the user, enabling the package to cope with any possible changes. It's available from Ssoft Computer Software (061-973 1097) price £9.95 (cassette), £12.95 (disk).

These packages are mostly unseen and untested, so don't take inclusion as any kind of guarantee of usefulness — or availability for that matter. If you've something you'd like us to include in a future issue, send details to: *Soft Stack, Y64, 14 Rathbone Place, London W1P 1DE.*

Writing For Y64

Y64 welcomes submissions of both programs and articles from readers.

In the case of programs, you should enclose the following items:

(a) Three verified copies (in case of LOADing difficulties) of the program on either tape or disk (disk preferred);
(b) A summary of what the program does and how it is used;
(c) Detailed instructions for use;
(d) A line-by-line breakdown (see *Keyboard Kapers* for an example of the sort of description we need).

Articles must be typed, computer-printed or clearly written. Write on one side of the paper only, leave wide margins all around and use double line spacing. If you use EasyScript, Paper Clip, Wordcraft 40 or Quick Brown Fox, please enclose a copy of the article on disk or tape as well as a printout; this is a great help to us. Both programs and articles should be accompanied by an appropriate sae so that your materials can be returned to you.

The more hi-tec of you can also send articles to us over the phone at either 300- or 1200-baud. Just phone Surya on 01-631 1433 to arrange this. You can also send short (<2k) messages to us via The Blandford Board (0258-54494) — leave a private message in the CBM 64 SIG addressed to *YOUR 64*. Longer messages and articles can also be sent via Telecom Gold addressed to 81:TCC007 (Sun Technical Services).

All submissions must be the original, unpublished work of the author(s) and must not have been submitted elsewhere. You will normally hear from us within 4-6 weeks. The address for all submissions is: *Y64, 14 Rathbone Place, London W1*

Price Correction

In our first issue, we incorrectly quoted the price of *Synthy-64* as £8.95. The £8.95 price related to a special offer. The prices as of September are £9.95 tape, £12.50 disk.

Sorry, Wrong Number

Our apologies to Impex Software for getting their telephone number wrong last month. It should have read: 01-900 0999.

LORDS OF TIME

Joins our range of acclaimed pure-text puzzle adventures, at £9.90, for:

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ADVENTURE REVIEWS

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners . . I am extremely impressed . . The Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Cave (Adventure) is nothing short of brilliant; rush out and buy it. While you're at it, buy their others too. Simply smashing!"
– SOFT, Sept 83

"I found Dungeon exceedingly well planned and written, with a fast response. There are well over 200 locations and the descriptions are both lengthy and interesting. The objects number about 100. It could therefore take some months to explore the whole network, giving many hours of enjoyment in the process."
– C&VG, Sept 83

"The descriptions are so good that few players could fail to be ensnared by the realism of the mythical worlds where they are the hero or heroine . . .great fun to play."
–Which Micro?, Aug 83

"My appetite has been whetted and I intend to get my own copy (of Snowball) to play."
– What Micro?, Dec 83



ADVENTURE REVIEWS

"This has to be the bargain of the year. If adventures are your game then this (Colossal Adventure) is your adventure."
– HCW, 5 Sept 83

"Colossal Adventure is simply superb. Anyone who wishes to use adventures in an educational setting really must use and see this program as it emulates Crowther and Wood's masterpiece so well. For those who wish to move onto another adventure of similar high quality, Dungeon Adventure is to be recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!"
– Educational Computing, Nov 83

Colossal Adventure is included in Practical Computing's Top 10 games choice: "Poetic, moving and tough as hell."
– PC, Dec 83

"To sum up, Adventure Quest is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you"
– NILUG # 1.3

"Colossal Adventure . . For once here's a program that lives up to its name . . a masterful feat. Thoroughly recommended"
– Computer Choice, Dec 83

"wholly admirable"
– Your Computer, Sept 83

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THE LORDS OF TIME SAGA

7: LORDS OF TIME
Our congratulations to Sue Gazzard for her super design for this new time travel adventure through the ages of world history. Chill to the Ice-age, go romin' with Caeser's legions, shed light on the Dark Ages etc. etc. We'll be selling this game mail-order from January 1st.

Price: £9.90 each (inclusive)

Level 9 adventures are available from good computer shops, or mail-order from us at no extra charge. Please send order, or SAE for catalogue, to:

LEVEL 9 COMPUTING

Dept Y64 229 Hughenden Road, High Wycombe, Bucks HP13 5PG

Please describe your Computer

PUZZLEPOINT 3

By Mike Liardet

In this month's Puzzlepoint your challenge is to put 21 hamsters safely to bed! They live in a splendid adventure playground (see Figure 1). During the day they all frolic about in the large play area (A), but at night they want to be tucked up in their bed chambers (B to I).

To get to bed they queue up at the exit from A, and then walk one at a time through the maze of tunnels. Once they reach a bed chamber they stop for their forty winks — unless, that is, they arrive at chamber H, where a mouse-trap sends them off to sleep for rather longer!

The hamsters are all too tubby to turn around in the tunnels and there's a gate at each fork which forces them either to left or right. In Figure 2, a hamster is approaching a gate which is set to turn it to the right as a hamster passes. But (Figure 3), it brushes a flange on the gate, closing it behind; the gate is now set to the left. The next hamster down the tunnel will go to its left, setting the gate back to the right again — and so on.

There are ten such forks in the tunnel (numbered 1 to 10 in Figure 1). The gates can be set before the first hamster moves off, and thereafter must be left alone. The objective is to get the right initial setting to see all the hamsters safely tucked up in bed. But there a few difficulties. Firstly, of course, none of the hamsters should arrive at H. And the bed chambers all have limited capacity: Chamber F holds one hamster, B holds two, C,D and G hold three apiece, E holds four and I holds five.

And to complicate life even more, the setting-handles on two of the gates are broken (although the gates themselves function correctly), so it's only possible to set up eight of the ten gates.

£10 book tokens are waiting for the first three readers giving the initial gate settings to see all the hamsters safely and comfortably abed.

GROUNDRULES

1. Please write the solution on the back of an envelope/ postcard. For each gate number give its initial setting: L (set to the left), R (set to the right), or B (broken setting-handle). For example: 1L, 2L, 3B, 4B, 5L, 6L, 7L, 8R, 9R, 10L indicates that 3 and 4 are broken, 8 and 9 are set to the right, and all others to the left. (These settings send the first hamster straight to the mouse-trap!)
2. All entries must arrive by 31st October. Address them to: *Puzzlepoint 3, Y64, 14 Rathbone Place, London W1P 1DE.*

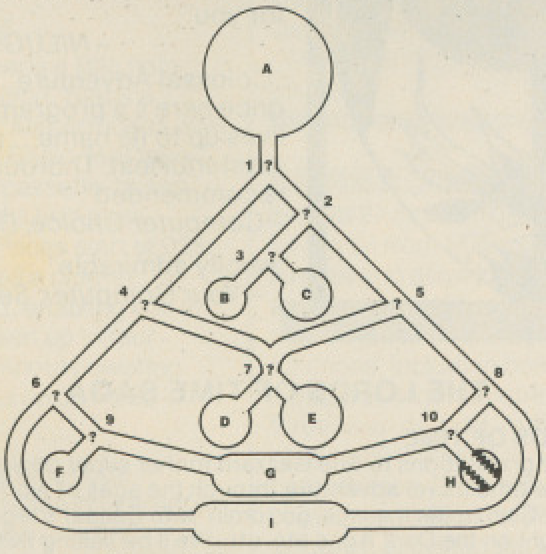


Figure 1. Hamster Playground.

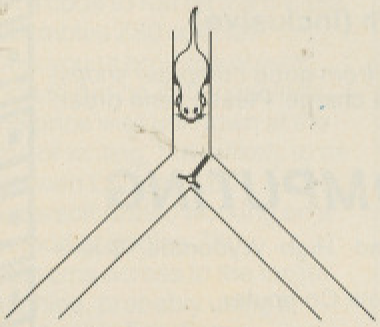


Figure 2. The gate is set to the right as the hamster approaches.

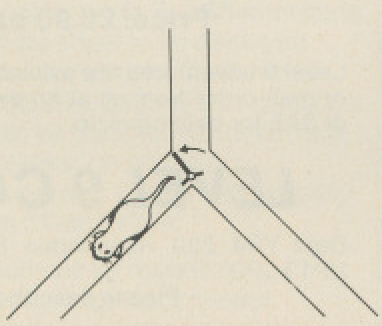


Figure 3. The hamster is forced to turn right, and the gate is set to the left.

YOUR OWN CHOICE CHARTS

You'll notice a lot of familiar names cropping up again in our chart — Valhalla is a familiar name but surprisingly hadn't featured in the Top 20 until this month. Still, straight in at number 3 no one can say it's not making up for lost time, and Hunchback is back, after a month of falling into disfavour.

Thanks for sending in those comments, keep filling them in, it takes a load off our editor's brain cells. Special thanks to the Shing family of Southport who are all avid participants and all have remarkably similar handwriting. A family of few words and many coupons.

The winner of this month's surprise package of software is *Matthew Ember* of Wembley, Middlesex, and all for being the first to come out of the hat.

Help keep our chart up to date by filling in the coupon (that goes for you too, Shings) and getting it into the post in time for the next issue (it's sooner than you think!)

YOUR 64 CHOICE TWENTY

your 64

My top five games for the **Commodore 64** are:

1 ______________

2 ______________

3 ______________

4 ______________

5 ______________

Name ______________

Address ______________

All polling slips should be mailed to: **Your 64 Choice Twenty, 14 Rathbone Place, London W1P 1DE.** (By all means send a photocopy if you'd prefer not to harm the issue.)

YOUR 64'S TOP TWENTY

THIS MONTH	LAST MONTH	GAME	COMMENT
1	9	**BEACH-HEAD** ACCESS	ABOUT TIME TOO! AT LEAST THE SHINGS GOT IT RIGHT —
2	4	**INTERNATIONAL FOOTBALL** COMMODORE	NUMBER TWO AND CLIMBING — KEEPS SOCCER FANS QUIET FOR HOURS — TONY WALTERS.
3	NEW	**VALHALLA** LEGEND	NOT ENOUGH BLOOD! — MG MERRINGTON
4	RE-ENTRY	**HUNCHBACK** OCEAN	QUASIMODO MUST HAVE BEEN ON HOLIDAY LAST MONTH BUT SLOUCHES RACK WITH A VENGEANCE.
5	6	**MANIC MINER** SOFTWARE PROJECTS	STRIKE ? WHAT STRIKE? WILLY HASN'T STOPPED ALL YEAR.
6	5	**FORBIDDEN FOREST** AUDIOGENIC	THE ARCHERS HIT THE SMALL SCREEN — MAT STILES
7	1	**REVENGE OF THE MUTANT CAMELS** LLAMASOFT	HAVE THE CAMELS QUENCHED THEIR THIRST FOR REVENGE OR ARE THEY JUST RESTING?
8	NEW	**TALES OF THE ARABIAN NIGHTS** INTERCEPTOR	THE ONLY GAME TO ACTUALLY TALK YOU INTO PLAYING IT — ANDREW CLARKE
9	13	**BUGABOO** QUICKSILVA	HELP A FLEA-BITTEN OLD DRAGON TO SURVIVE UNTIL THE NEXT ISSUE.
10	NEW	**DECATHLON** ACTIVISION	BIT LATE FOR THE OLYMPICS BUT BETTER LATE THAN NEVER — PAUL LYTTON
11	3	**THE HOBBIT** MELBOURNE HOUSE	SO BILBO CAN'T KEEP IT UP!
12	7	**AZTEC CHALLENGE** US GOLD	EXCELLENT SOUND AND GRAPHICS — SIMON CHARLES
13	NEW	**LOCO** ALLIGATA SOFTWARE	UNLUCKY FOR SOME — KEEP AN EYE ON THE SKY ON THE WAY HOME TONIGHT — T WHEELER
14	NEW	**DALEY THOMPSON'S DECATHLON** OCEAN	CAN DALEY MAKE IT TO NO. 10 BY NEXT MONTH?
15	NEW	**JAMMIN** TASKSET	NEVER HEARD OF IT BUT WORTH A TRY IF YOU SAY SO — ED.
16	NEW	**SHEEP IN SPACE** LLAMASOFT	YURI GAGARIN EAT YOUR HEART OUT — CHRISTOPHER COATES
17	NEW	**FLIGHT SIMULATOR II** SUB LOGIC	THERE'S A LOT OF NEW DENTS IN THE RUNWAY! — S MULCAHY
18	15	**SON OF BLAGGER** ALLIGATA SOFTWARE	BLAGGER THE KID HAS HAD HIS DAY
19	16	**CHINA MINER** INTERCEPTOR	BUT THESE ORIENTAL SCABS ARE NO MATCH FOR WILLY — JASON MACMILLAN
20	NEW	**ENCOUNTER** NOVAGEN	NOT ANOTHER 3D SHOOT-EM-UP! AT LEAST IT'S ONLY NO. 20

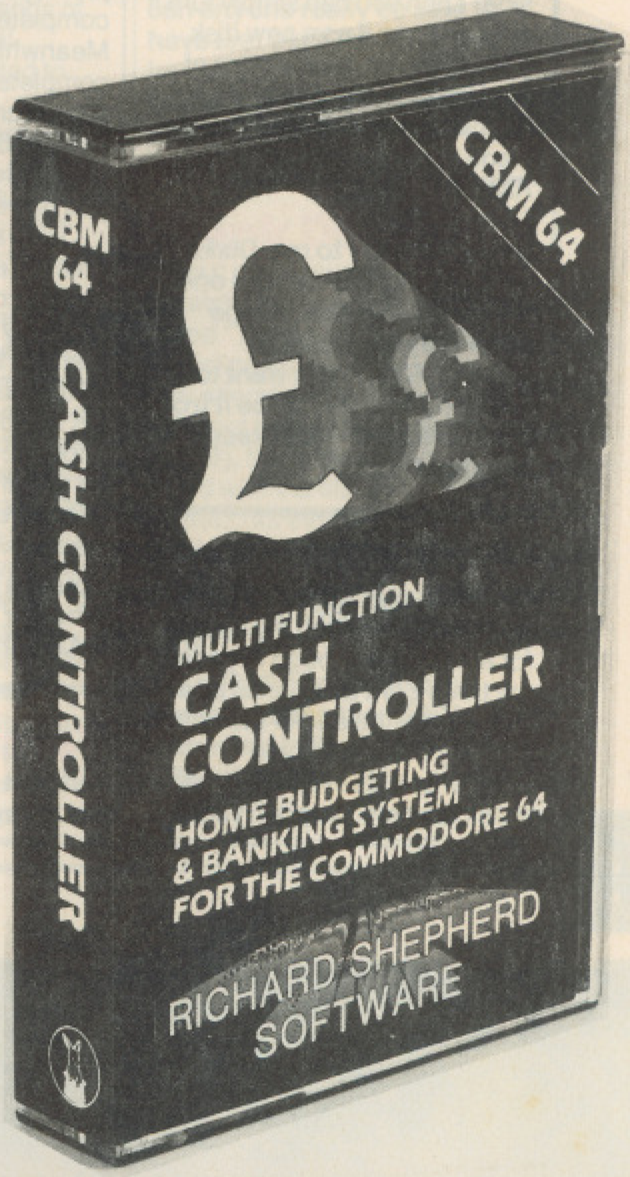
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MISSIVES

Y64 *welcomes correspondence on any and all aspects of computing a la 64. Funnies, straights, anguished pleas for help.* 14 Rathbone Place, London W1P 1DE.

Free disks!

A great way to save money on disks is to cut a new write-protect notch on the reverse side. Then you can simply turn it over and use it as a new disk, giving you two for the price of one! I use an old disk as a template, and a sharp razor blade to cut the notch.

Alison Staines,
Leiston, Suffolk

Sounds dodgy to me. Disks sold as single-sided are only tested on one side, so the other may not be up to scratch. Still, if you want to live dangerously, far be it from me to criticise — just keep a backup! Ed.

More Zork Talk

I've read your "Zork Talk" article and you've whetted my appetite for adventure enough to get out my three Zork disks once again.

Towards the end of the article you say there are some wonderful aids available (maps, invisiclues etc.) to push you in the right direction. Could you please tell me how I can get hold of these?

As for Zork II and III I've only just explored but want to complete them in sequence. Meanwhile on my side I have completed all the Mysterious Adventure Series from Channel 8 (CBM 64) so if you want any help, indeed detailed solutions, you're welcome.

Congratulations on a great article. I envy you obviously having completed the first two parts (by now you've probably cracked the third). I've got my three disks from Commodore UK so no info was enclosed re Infocom. Any help from you will be gratefully received.

Jason Deane
Penmaenmawr, Gwynedd.

You can reach Infocom at: 55 Wheeler St., Cambridge, MASS. 02138, USA. Ed.

Tenner Letter

This isn't a complaint letter but just to say how much I enjoy *Your 64*. However, I think it needs some more alterations. For a start you seem to be using the same colours, i.e. for headings you always use black and grey, and always the same letter shape. Why not use more colours and make the letter shape more interesting? And I also think you should have "Wally of the month" sending him/her some kind of prize. Also the nastiest letter of the month, put down his full name and address so that we can all write letters to him. And an information page where readers send information in on how to get past a certain level on a game. The reviews are my main concern. WHERE HAS ALL THE COLOUR GONE? I think you should have a colour screen and a black and white one. Also try to review all the most modern games such as Dangermouse, Evil Dead, Decathlon etc. Also why not have Your 64 hits, reviewing them and giving them not just a verdict then a percentage, but something like this: Availability, Playability, Graphics, Sound, Lasting Interest, Price, Value. Each verdict would be out of ten, represented by stars or another symbol. Also "Clark's Classic" is a good idea but needs to have more than a page to itself, showing more than one picture of the game. Also programmer of the month should be included. The Your 64 Top Twenty is good but should be before the reviews. And you should get the readers to send in a poll for the best buy and the worst buy represented by a bar graph all in the same section of the reviews. That's all I've got to say. But besides all that your 64 is my favourite magazine and the best one yet for the 64.

Peter Carthy
Bispham, Blackpool

You're one step ahead of us, because there's a Reader Survey in this issue to give everyone a chance to have their say!

We're sorry about the lack

MISSIVES

of colour last issue — see Whoops! **on page XXX. Regarding POKEs and tips for games — you send 'em in, we'll print 'em. Thanks for your other suggestions: these, and the responses to the Reader Survey, will be given careful consideration. Ed.**

Drive Confusion

I want to buy a disk drive for my 64. I've seen in *Y64* and elsewhere reports that the standard 1541 drive is very slow. Is there a faster drive I could buy? Also, a friend has a VIC-20 with a 1540 drive. Could you please tell me what's the difference between the 1540 and the 1541, and are they compatible?
Roger Shaw,
Huddersfield, West Yorks

Taking your questions in reverse order (well, why not?), the 1540 drive was originally intended for both the VIC and the 64. However, the drive proved to be — believe it or not — too fast for the 64! To combat the problem, Commodore altered the drive to provide a modified model, the 1541. If you have a 64, you should get the 1541; VIC owners should get the 1540 as it's faster. Otherwise, the drives are compatible. The reason the 1540 and the 1541 drives are so slow is that they are actually serial devices: in a sense, they are not true disk drives at all. You can buy a true parallel drive, which is much faster — the 4040 is recommended — but you'll need to invest in an IEEE interface in order to connect it to your 64. Your local Commodore dealer should be able to help — Ed.

Condoning piracy?

As a software author, I was rather surprised to see you giving editorial coverage to a program which can only aid piracy (*Hypersave-64*, issue 2, p8). And again encouraging a more subtle, but equally undesirable, form of piracy in your Scratchpad section (*Sprite Copier*, issue 2, p21). Piracy is theft.

Magazines have a responsibility to take a firm stance against piracy in all its forms — Joe Public making a 'backup' for his mate just down the road is just as guilty as those who make thousands of pounds from their illegal activities. I'd be interested to hear your views on this.
Richard Norwell, Basingstoke, Hants

Sprite Copier carried a warning against using it for commercial purposes without permission. So far as ***Hypersave-64*** **is concerned, it's the age-old argument of the bread knife: It seems to me self-evident that the solution to the problem of piracy is not to ban backup programs any more than the solution to the problem of violence is to ban bread knives.** ***Hypersave*** **has perfectly legitimate uses: I for one will not buy a program unless I know that I can make security backups. Nobody would deny that 'production-line piracy' is harmful to programmers, software houses and the consumer alike. This is, as you say, theft. But small-scale piracy is another matter. If Joe Public and his mate down the road get together to buy a program that neither could afford individually, and Joe then makes a copy for this mate, can anyone really be said to have lost out? The software house has not made one sale instead of two, it has made one sale instead of none — Ed.**

Blank Dismay

In your no.2 issue of Scratchpad, you list a program called "Typewriter". I typed in the listing very carefully (my only alterations were to enable it to print to my 1520 printer plotter), but when I ran it, I was faced with the title and a blank screen, not even a cursor. Could you lighten my darkness?
TH Brown
Longbenton, Newcastle on Tyne

For a 1520 printer plotter, simply change the OPEN statement in line 40 to read OPEN 4,6. Ed.

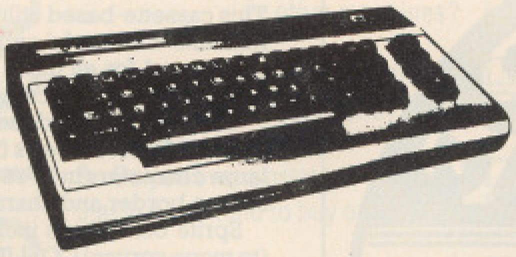
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Please fill in the questionnaire *after* reading this issue — that way, you've got a better idea of the sort of things we're doing already. The questionnaire should be returned to: *Y64 Reader Survey, 14 Rathbone Place, London W1P 1DE.* The latest date for replies is 5th November — after that, the info is still welcome, but you'll be too late to be considered for the prize.

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adventures?	☐	☐
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12 And finally, what new type of feature would you like to see in Y64? Remember, your answer to this question could win you £500 worth of prizes!

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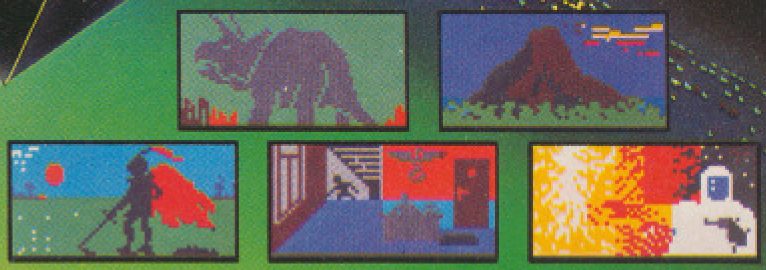
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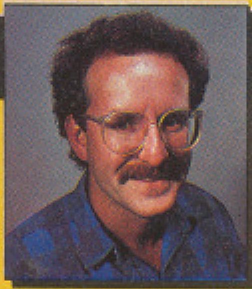
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The Complete Cross Check of

Once Commodore had seen fit to offer only PET Basic Version 2 on the 64 (no disk commands, no graphics or sound commands, and worst of all, no DELETE) it was hardly surprising to see a number of packages appearing on the market to supplement the existing commands. Keith Bowden *offers his definitive report on the full range of products available.*

6 4 B A S I C EXTENSIONS

The 64 is often criticised for having only standard PET basic, but in some ways, this is actually a rarely recognised boon. Firstly, Basic extensions can be added as desired from the selection presented here — and while there's an argument that users shouldn't have to pay extra for a decent interpreter, this way you can at least have your own choice of commands and statements. Secondly, Basic programs written on other Commodore machines can be run on the 64 with little or no modification. And thirdly, Basic runs considerably faster when unencumbered by graphics and sound commands. We'll start with a brief introduction to each of the Basic extension products, before going on to compare features.

Package Data

Simons' Basic (Commodore)

Simons' Basic is Commodore's own offering for the UK market (the company has a similar, though not identical, product in the States). It comes supplied on disk or cartridge in a smart A4 storage box with an excellent (and thick) manual. On offer are 114 additional commands for graphics, sound, structured programming, toolkit and other facilities. Simons' Basic II (available at present only as an optional upgrade to the original) has a further 94 commands — including interrupt-driven sprites. Commodore wonder boy David Simons (author of both packages) is usually criticised for his poor implementation; while this criticism is perhaps not entirely undeserved, the packages aren't as bad as all that and, looking at the selection of toolkit commands available in Simon's Basic 1, it really does seem quite reasonable value for money — even at £50. Nevertheless, it might have been an idea to throw the extension in with the price ... rather than charging an extra £15 for it.

Graphix 64 (Supersoft)

One of the first Basic extension packages, and available on both cassette (£10) and disk (£12), Graphix 64 concentrates entirely on high-resolution bit-mapped graphics, though it lacks the CIRCLE and FILL commands. It's in fact used more as a graphics library than a Basic extension ... because its main mode of operation is SYSing to a series of machine language routines.

Screen Graphics and UltraBasic (Abacus)

Two programs imported by Adamsoft. Screen Graphics is again restricted to graphics commands, but includes facilities for defining and moving sprites. The FILL and CIRCLE commands are very good, though CIRCLE has a harmless but fascinating bug in it — try drawing a series of concentric circles with the RND function as the colour parameter. UltraBasic is an expanded version of Screen Graphics, with some useful additions for sound and peripheral handling. Both come with demonstration programs, and detailed on-screen tutors really help to make learning the languages a pleasure. In particular, the UltraBasic demo is quite

> "Users shouldn't have to pay extra for a decent interpreter, but you can at least choose your own commands"

amusing, with a little alien landing in a spaceship and rushing off into the woods — as if he needs to use the loo!

It appears that Abacus intends to replace Screen Graphics with UltraBasic; the former has been available in the UK for some time at around £7, but since the appearance of UltraBasic (at around £20), the price of the former has shot back up to the recommended £15, giving it a very tiny market slot. The latest version of UltraBasic features an improved CIRCLE command and double-size screen dump to a VIC or Epson dot matrix printer — and Adamsoft reports that Mosoft (UltraBasic's US manufacturer) is trying to adapt a Toolkit 64/Monitor (£7.95) to run with it. Both UltraBasic and Screen Graphics are available on either cassette or disk.

BC Basic (BC Computers/Kuma)

BC Basic is far better thought out than Simons' basic, though not as comprehensive. It offers 94 additional commands, but doesn't include a toolkit option. (I spent some time trying to get it to work with Kobra's Power 64 — reviewed next month — but without success.) It comes supplied on cassette and disk with an adequate manual, and it's excellent value at £20 and £23 respectively. An updated version that includes interrupt-driven sprites and other 'goody' additions is being marketed by Kuma on cartridge, but at £46 it's strictly 'birthdays only'. The cartridge is supplied in a plastic video-style case with an improved manual. The review cartridge caused excessive screen noise, to the extent that I had to change the default colours. I don't know whether this is a general problem, but my advice is to try before buying. Demo programs are provided for all versions.

HoneyAid (Honeyfold)

HoneyAid is available as part of Honeyfold's excellent Beginner's Basic Course (which consists of a thick manual, and a tape containing both HoneyAid itself and the demonstration programs in the book).

HoneyAid adds 25 commands to Basic, covering high-resolution graphics (though not multicolour), sound and music, and utilites. All the commands can be used in direct mode and the package is flexible and well-implemented. HoneyAid only clears the graphics screen when told to and not every time HIRES is called (unlike some packages) and the PLAY command will play a series of up to 6630 notes. The facilities are often poorly implemented, but are at least comprehensive: at fifteen quid for the whole package (cassette only), this is relatively good value for money.

HiRes 61 (Sue's Software)

Sue's Software was set up specifically to market this one product, and with its duplicated manual and cassette insert, HiRes makes no attempt to hide its lowly origins. Nevertheless it's good to see that the cottage industry is still alive and kicking! The package concentrates entirely on high-resolution and multicolour graphics, with options for saving and restoring screens, graphics characters, extended background colour mode, user-defined characters and split-screen. There's no

invert or erase facility in multicolour bit-mapped mode.

The syntax is idiosyncratic and hard to remember, and the manual is pretty awful (with an excess of spelling and grammatical errors) but — on the plus side — a memory map is included. Sue's Software tells me that a new version of the package should be available soon that'll offer friendlier commands (including an interesting sounding PALLETTE), and an improved split-screen facility and 27K RAM available to the user. Demonstration programs are included with each package and you'll pick up a copy of HiRes 64 for around £10 (cassette only).

Turbo (Aztec)
Turbo covers toolkit, graphics, sprite and sound commands — a smattering of each category, and REPEAT-UNTIL thrown in for good measure! It's supplied on cassette and at £10 represents reasonable value for money.

Extended Basic (Duckworth)
Here's a package that includes high-resolution and multicolour graphics commands, with a particularly effective extended DRAW-TO-TO- for lines (though no CIRCLE, PRINT, ERASE or INVERT). High-resolution characters, sprites (including a strange collision-detection routine) and sound are all supported. Indeed the sound facilities are very impressive, utilising most of the facilities of the SID chip — including synchronisation, ring-modulation and filtering, plus a detailed PLAY command for music. Strangely the latter is exited by pressing a key, and it's probably the worse documented command I've ever seen. The combined efforts of everyone I know who has used the package have still to solve the mystery of K! And I'm afraid the rest of the manual is little better.

Other commands support joystick, light-pen, paddles, and toolkit. The cassette loads in two parts, with a demonstration in between requiring a number of keypresses; you have to stagger through this extremely tiresome business every time you want to use Extended Basic! What makes it worse, the music demo sounds like a three year old playing on a Woolworth's guitar. Duckworth's Extended Basic (cassette only) will set you back around £18.

ACOS+ (Melbourne House)
A name you'll find elsewere in this issue is ACOS+, a program that concentrates on sprite and sound handling and gets on with the job excellently. It does, however, also offer a built-in cassette operating system (ACOS), the virtues of which are investigated in a following issue. Not wanting to waste precious space, let's just say that, at £15, the cassette comes nicely packaged with an adequate (if small) manual.

Scope (ISP)
In some ways, Scope is a bit of a 'ringer' here in that it's not a Basic extension package at all, but really a compiled language in its own right. However, instructions are included for calling Scope routines from Basic, and hence its inclusion.

Originally launched for the Sinclair Spectrum, it's aimed squarely at those who want to write their own games; thus, like ACOS+, it concentrates on sprites and sound. The compiled code, however, is both fast and transportable ... programs

THE FEATURES COMPARED

	SIMONS' BASIC I	SIMONS' BASIC I + II	GRAPHIX 64	SCREEN GRAPHICS 64	ULTRABASIC	BC BASIC	TURBO	HONEYAID	DUCKWORTH	HIRES 64	ACOS+	SCOPE
TOOLKIT												
DELETE		●					●	●				
CHAIN		●										
RENUMBER	●						●	●	●			
FUNCTION KEYS	●					▲						
AUTO	●							●				
MERGE	●							●				
OLD	●						●	●	●			
TRACE	●											
FIND STRING	●						●	●				
DISK COMMANDS	●											
DIRECTORY	●										■	
CASSETTE											●	
OPERATORS AND FACILITIES												
HEX TO DEC ETC	●					●						
FORMATTING	●					●	●					
DEEK & DOKE		●					●				●	
PLING						●						
WINDOWS	●											
SORTING		●										
ARRAYS		●										
PAUSE	●						●					●
EXTENDED COLOUR										●		●
STRING HANDLING	●					●						
USER COMMANDS											●	
GRAPHICS												
DEFINE BANK			●									
SPLIT SCREEN			●							●		
TURTLE	●				●							
HIRES	●		●	●	●	●	●	●	●	●		
MULTICOLOUR	●			*		●			●	●		
DOT	●		●	●	●	●	●	●	●	●		
QUERY PIXEL	●		●	●	●	●	●		●	●		
LINE	●		●	●	●	●	●	●	●	●		
CIRCLE	●			●	●		●			●		
FILL	●			●	●					●		
INVERT MODE			●									
GRAPHIC TEXT	●			●	●	●			●			
SAVE/LOAD		●		●	●	●				●		
SPRITES	●			●	●	●	●		●		●	●
UDG	●					●			●			
GRAPHS		●		●	●							

In this comparison table, we've taken the features we think should be included and checked each package.
▲ Cartridge only
■ Cassette only
Half-resolution (see text)

it produces can be run without the package.

Scope costs £17.95 on tape, £18.95 on disk, with a number of demonstration programs and a good A5 spiral-bound manual. It handles single- and double-length integers, but not real numbers. A total of 52 variable names are available and a Scope program looks remarkably like a piece of 6502 assembler code. In fact, Scope is really a modified macroassembler that's specifically aimed at the games writer.

My main criticism of the package is that there isn't enough of it. And even though the compiled code is fast, there's very little here that you can't do in Basic, and a lot missing that you can do. Scope II, with a considerably extended command set, is now available for the Spectrum. When I asked if we could expect a Scope II, 64 style, the company responded with the traditional 'no comment'. (*Since this review was written, ISP has gone into liquidation, so a Scope II looks unlikely. Ed.*)

	SIMONS' BASIC I	SIMONS' BASIC I+II	GRAPHIX 64	SCREEN GRAPHICS 64	ULTRABASIC	BC BASIC	TURBO	HONEYAID	DUCKWORTH	HIRES 64	ACOS+	SCOPE
SET BACKGROUND	●			●	●	●			●	●		
SAVE CHARSET										●		
SPRITES												
DATA STATEMENTS	●			●	●	●	●		●			
RASTER SYNCH		●				●					●	●
NO. OF FRAMES	160	160		32	32	255	255		255		255	255
COLLISN DETECT	●				●	●	●		●		●	●
INTERRUPT DRIVE		●				★						
ROTATE	●				●							
COPY TO HIRES		●										
BACKGROUND PRIO						●						●
MULTICOLOUR	●	●		●	●	●	●					●
PLAYER MISSILE											●	
QUERY SPRITE											●	
SOUND												
WAVEFORM	●					●	●	●			●	●
ENVELOPE (ADSR)	●					●	●	●			●	●
VOLUME	●					●	●	●	●		●	●
FILTER		●				●	●		●		●	●
CHAN 3 OFF						●						
CUTOFF FREQ						●					●	
USE ENV 3						●						
RESONANCE						●					●	
PULSE WIDTH		●				●	●	●			●	●
BEEP		●										
RING MODULATION						●			●			
SYNCHRONISATION						●			●			
SLIDE											●	
MUSIC	●				●			●	●			●
STRUCTURED PROGRAMMING												
IF..THEN..ELSE	●					●						
REPEAT...UNTIL	●					●	●					
LOOP	●											
PROC	●					★						
LOCAL VARS	●					★						
PARAMETERS						●						
ON ERROR	●											
PERIPHERALS												
GRAPHICS DUMP	●				●							
LIGHT PEN	●				●				●			
PADDLES	●				●	●			●			
JOYSTICK	●				●	●			●			
USER PORT									●			

Cross Comparisons

Conceptually, BC Basic is the most sophisticated of the batch, most commands having both optional and default parameters. Both BC Basic and Graphic 64 allow rearrangement of the 64's memory map, and Simons' Basic stores the graphics screen in the RAM under the operating system kernal, thus saving memory. Similiarly the Abacus packages use the RAM under the Basic interpreter.

Toolkit Factors

Simons' Basic, Turbo, HoneyAid and Extended Basic all feature toolkit commands, to a greater or lesser extent. Simons' Basic includes AUTO, RENUMBER, function key definitions and so on, but not DELETE (unless you have the extension package). Both Simons' Basic and BC Basic have some string-handling functions and dec/hex/binary conversions — and DEEK, DOKE and Pling (!) respectively. Simons' Basic has simplified disk commands (the same system that Kobra's Power 64 uses) and allows independent scrolling windows on parts of the text screen. Turbo, HoneyAid and Extended Basic all include RENUMBER and AUTO (automatic line numbering). The first two include DELETE, and HoneyAid and Extended Basic have a useful facility for finding a character string in a Basic program.

ACOS+ supplies a full cassette operating system for non disk drive owners. This is a very sophisticated and well implemented system. Commands are DIRECTORY, DIRLOAD and DIRSAVE (like LOAD"S",1) — the tape must be rewound before these are carried out — DRUB (erase file), CSAVE and CLOAD for Basic files, MSAVE and MLOAD for machine code, MVERIFY and COPEN. I'm full of praise for ACOS+!

Graphic Qualities

All of the packages except ACOS+ and Scope support high-resolution graphics. The most glaring omissions occur in Graphix 64, BC Basic, HoneyAid and Extended Basic, none of which have CIRCLE or FILL (PAINT) commands. Graphix 64 and HiRes 64 also offer split screen options.

UltraBasic has a turtle graphics facility — and even features a little turtle-shaped

Y64 BENCHMARKS

	CIRCLE	FILL
SIMONS' BASIC I+II	240	47
SCREEN GRAPHICS 64	25	85
ULTRA BASIC	25	85
HI RES 64	175	40
TURBO	30 MINS+	NOT SUPPORTED

A simple comparison of speed (all timings in seconds).

sprite that moves around the screen while drawing lines. Simons' Basic II, Screen Graphics, UltraBasic and BC Basic have screen save and restore options, but none of these appear to perform any sort of data compression (that is, they are slow — taking around five minutes to tape). With Screen Graphics and UltraBasic the function keys f5 and f7 can be used to switch between graphics and text modes (even when a program is running!) BC Basic provides a function which synchronises screen changes with the television raster scan — to eliminate screen flicker.

For better comparison, I decided to benchmark the CIRCLE and FILL commands in Simons' Basic, HiRes 64, Turbo and the Abacus packages. For FILL, a circle of diameter 100 was FILLed; for CIRCLE a series of concentric circles of radii 1 to 100 screen pixels were drawn. (see Benchmarks)

Multicolour Mode

A vital aspect of Commodore 64 graphics utilities must be its treatment of multicolour mode. This makes use of character square graphics (as does high-resolution mode on the 64) but in this case, each character square is allowed two colours in both the foreground and background layers — although at the expense of the horizontal resolution. Graphix 64 does not support multicolour mode at all, while the Abacus packages do, although with reduced vertical resolution for symmetry. This is, frankly, a stupid idea. They use a system of three 'paintbrushes' to rationalise the use of the colours — which isn't a lot of help when you're considering the screen layers for mixed bit-mapped and sprite work. Only BC Basic provides this facility, giving 16 different plotting modes (all combinations of colour1, colour2, foreground, background, plot, invert, erase and null) — essential for full use of this most powerful mode.

Simons' Basic and UltraBasic both allow high-resolution screen dumps to graphics printers like the CBM 1525 (which is a lot more use than the colour plotter for most applications).

Sprite-lines

Sprite-handling, including collision detection, is covered pretty thoroughly by all the packages except Graphic 64, HoneyAid and HiRes 64 — which have no sprite commands at all. In each case sprites are defined simply using a block of data statements containing only 0s (unset pixels) and 1s (set pixels). The shape of the sprite is thus easily visible in the program. Commands are provided to move the sprites around the screen, with all the expected options, including collision detection (except on Screen Graphics).

The number of sprite frames that each sprite on the screen can be associated with for animation purposes is sometimes limited, as shown in the table. The worst case is the Abacus packages, which only allow 32 sprite frames. Simons' Basic II and Kuma's BC Basic both support interrupt-driven sprite movement (which means that you can not only give a sprite a position, but a direction too — allowing it to pootle off, all by itself, until you tell it to stop!). The former, by the way, has a wonderful feature which allows copying between the high-resolution screen and sprites.

ACOS+ simulates the player-missile sprite arrangement used on the Atari machines. This allows four 'player sprites', each of which has a 'missile sprite' attached. These can be fired (released) by, for example, pressing the fire button on a joystick. It also allows each sprite to be attached directly (interrupt-driven) to a joystick. Thus your mates can play an arcade game on the screen while you continue to write your program!

Sound Interests

Screen Graphics, Graphix 64 and HiRes 64 don't support the SID (sound) chip at all. Of the rest only BC Basic supports all the available features (including ring modulation and filtering) and only Simons' Basic and UltraBasic support interrupt-driven music generation. The latter allows music to be played while your game, or whatever, is running — without disturbing the action. I don't consider support of sound commands quite so important as graphics, partly because graphics commands are the first things most people look for, and partly because — provided you look up all the relevant POKEs in the manual — its' quite easy to drive the SID chip from Basic anyway. It's not quite so easy to write a FILL command. However, interrupt-driven music is a feature well worth having. The only facility in any of the packages which allows the quality (rather than the amplitude) of a note to be changed while it's playing is the SLIDE command in ACOS+, which gives a glissando effect.

Structured Programming

Simons' Basic has a large number of structured programming commands, and BC Basic supports IF-THEN-ELSE and REPEAT-UNTIL; however, most of the

THE SCORE CHART

PACKAGE ATTRIBUTE	SIMONS' BASIC I	SIMONS' BASIC I+II	GRAPHIX 64	SCREEN GRAPHICS 64	ULTRABASIC	BC BASIC	BC BASIC (KUMA)	HONEYAID	TURBO	DUCKWORTH	HIRES 64	ACOS+	SCOPE
UTILITIES	7	8	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	6	3	3	NOT SUPPORTED	5	NOT SUPPORTED
OPERATORS	6	7	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	4	4	NOT SUPPORTED	3	NOT SUPPORTED	1	2	1
HI-RES GRAPHICS	8	9	7	8	8	8	8	3	5	6	7	NOT SUPPORTED	1
MULTICOLOUR GRAPHICS	8	9	NOT SUPPORTED	3	3	8	8	NOT SUPPORTED	3	3	7	NOT SUPPORTED	NOT SUPPORTED
SPRITES	6	9	NOT SUPPORTED	5	6	6	7	NOT SUPPORTED	3	3	NOT SUPPORTED	9	.3
SOUND	7	7	NOT SUPPORTED	NOT SUPPORTED	7	10	10	3	4	7	NOT SUPPORTED	7	5
MUSIC	3	3	NOT SUPPORTED	NOT SUPPORTED	3	NOT SUPPORTED	NOT SUPPORTED	3	3	5	NOT SUPPORTED	NOT SUPPORTED	3
STRUCTURED PROGRAMMING	5	5	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	4	6	NOT SUPPORTED	1	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED
ARRAYS	NOT SUPPORTED	4	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED
PERIPHERALS	4	4	NOT SUPPORTED	NOT SUPPORTED	4	3	3	NOT SUPPORTED	NOT SUPPORTED	4	NOT SUPPORTED	NOT SUPPORTED	NOT SUPPORTED
EASE OF USE	5	5	9	8	8	10	10	5	4	3	3	7	7
DOCUMENTATION	9	UNSEEN	5	7	7	6	8	9	3	2	3	6	8
VALUE FOR MONEY	6	5	6	7	8	10	6	6	6	4	5	8	NOT SUPPORTED
OVERALL RATING	57%	58%	21%	29%	42%	53%	55%	27%	29%	21%	20%	34%	22%

The ratings which are based on the opinions of the reviewer, are each out of ten. The total rating is the total of the individual ratings expressed as a percentage.


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64 BASIC EXTENSIONS

features in Simons' Basic reduce to the latter anyway, and are implemented in a very non-standard way. The PROCedures are a joke as far as structured programming is concerned. The BC Basic cartridge supports a full structured Basic that's very similar to BBC Basic. Even so, its procedures stack is only 16 entries deep — which dramatically limits the use of recursive routines (a recursive FILL routine could only FILL 16 pixels!)

Simons' Basic, UltraBasic, Extended Basic and BC Basic all support light-pens, paddles and joysticks. And finallly, Simons' Basic II also supports matrix algebra. Or does it? Try multiplying two arrays ... it's not what I learned at school!

Summary

None of these packages are perfect, none can be dismissed out of hand, and none comes out as best regardless of price. They all have their place in the current market. Simons' Basic wins on sheer quantity of facilities, but fails rather on quality and price. BC Basic and UltraBasic are both highly recommended — BC Basic is the only one to support multicolour mode properly (and yet it has no CIRCLE or FILL commands) while UltraBasic has the best CIRCLE and FILL; choosing won't be easy.

Now that the price of Screen Graphics has gone up, even Graphix 64 has its place; Turbo too has a lot of options for the money, but they are poorly implemented. HoneyAid's Beginner's Basic Course is excellent value, but Extended Basic is best avoided until Duckworth sorts out the problems with its documentation; the package is also overpriced when compared to the rest. HiRes 64 suffers from poor documentation too, but on the other hand it's the cheapest available — unless Screen Graphics can still be found at a discount price. ACOS+ and Scope are both recommended for more specialist applications (that is, games).

You'll see in our table that points have been awarded to each package over a number of categories, leading to an overall 'value for money' calculation. More points have been awarded to a particular function where it involves a great deal of sophisticated machine language programming — something which most users couldn't reproduce easily themselves (for example, CIRCLE, LINE, FILL and interrupt-driven functions). For instance:

```
DELETE "FILENAME"
```

is far more convenient than

```
OPEN15,8,1,"SO:FILENAME":CLOSE15
```

but it really only saves typing. BC Basic comes out best overall, but the score chart is subjective and all the packages are worth considering.

EXTENDED BASICS: THE SUPPLIERS

PACKAGE SUPPLIER	NO: OF KEYWORDS ADDED	PRICE
SIMONS' BASIC I+II COMMODORE 0753-74111	198	£65
SIMONS' BASIC I COMMODORE: 0753-74111	114	£50
BC BASIC (CART) KUMA COMPUTERS: 0753 74335	107	£46
BC BASIC (DISK) BC COMPUTERS: 31a Grosvenor Ave, Nott.	94	£20
ULTRABASIC ADAMSOFT: 0706-524 304	50	£20
SCOPE (CASS) DEALERS (ISP NOW IN LIQUIDATION)	46	£17.95
SCOPE (DISK) DEALERS (ISP NOW IN LIQUIDATION)	46	£18.95
TURBO AZTEC SOFTWARE: 0924-492826	45	£15
ACOS+ MELBOURNE HOUSE: 01-940 6064	33	£15
GRAPHIX 64 SUPERSOFT: 01-861 1166	33	£12
HONEYAID HONEYFOLD: 01-441 4130	27	£15
HIRES 64 SUE'S SOFTWARE:	27	£10
EXTENDED BASIC DUCKWORTH: 01-485 3484	26	£18.50
SCREEN GRAPHICS 64 ADAMSOFT: 0706-524304	24	£15

ISSUE 1



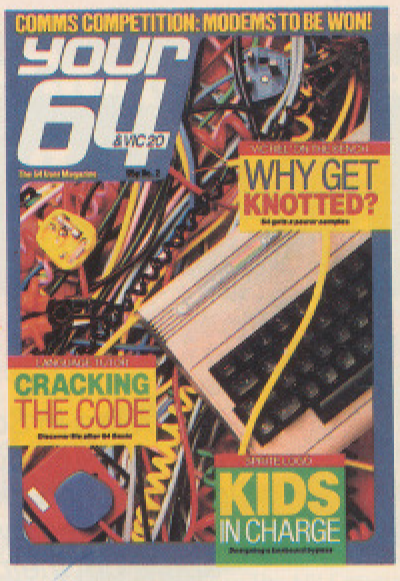
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STRAIGHT FROM THE NORSE'S MOUTH, ANDY HOLDERNESS FINDS ADVENTURE

NØRSE CODE

According to Scandinavian mythology, Valhalla is the Hall of the Slain, with 450 doors so wide that 800 men can enter abreast. Here Odin feasts on mead and boar's meat with the heroes brought from mortal battles by the Valkyries. They fight each other every day for sport, but their wounds are magically healed by banquet time.

You too are in Valhalla, with six quests before you — you must seek out a number of special objects hidden around the Hall, Midgard and Hell. These are cunningly disguised as the ordinary objects that you'll need just to survive in this realm, for in this game, unlike in other adventures, you are not alone...

You may, during other games, have had the distinct feeling that someone behind you was about to do something extremely nasty. In this game, they are! The other characters appear on the screen with you and begin to move around, fight, eat, drink, and gather up the treasures before your very eyes. Unfortunately, the idea of fighting as the way of life chosen by these warriors means that unless you can obtain the wherewithal of combat (a shield, helmet and sword or axe at the very least), you will not survive for long. Fear not, though, for there is truth in the legends — the nether regions of Hell await you in the afterlife where even your strength is restored! You may even need to get yourself killed to escape some of the traps laid for you.

Speaking of strength, don't forget to eat and drink — although I found no feast there was, in the early stages of the game anyway, an abundance of food and wine. But remember that the other characters need sustenance as well and will use up the stocks unless you prevent them from doing so. Also (as the manual reminds you) food will do you more good than wine(!).

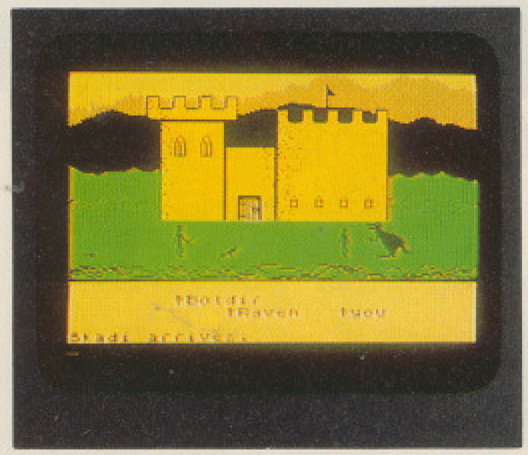
The size of the population, at least 37 other characters besides yourself, makes this a game very difficult to play immediately — you can't just go blundering about the place. In order to fulfil your quest, you must interact with the other players in the scenario, remembering that your dealings with others affect your character.

For instance, if you start attacking the good guys Like Thor or Odin you can probably expect some help from the villains — Loki & Co. (don't depend on it though!). The manual is one of your best allies here, it lists all the characters (except the raven, for some reason), listing their attributes in terms of their goodness/badness, charisma, strength, bravery and brains — if you read carefully this should ensure that you don't, for example, ask a puny frightened dwarf to kill a giant for you. But don't overdo it — my experience, (based admittedly on an incomplete game) was that it is generally better to do your own killing (where necessary, and I'm not really sure if it's always necessary!), and if you have no battleaxe to grind, confine your relationship to trading and treasure negotiations. This can lead to some interesting exercises in diplomacy as you try to stay in everyone's good books so don't be too surprised if a hard object is suddenly thrown at you by an erstwhile friend (throwing something at another player automatically starts a fight). Personally, I wasn't too good at dealing with the other personae, and seemed to be under constant attack most of the time; and it gets you down a bit to find yourself dead, resurrected in Hell, and promptly killed again... but I usually only ended up on the outskirts of Hell the second time around!

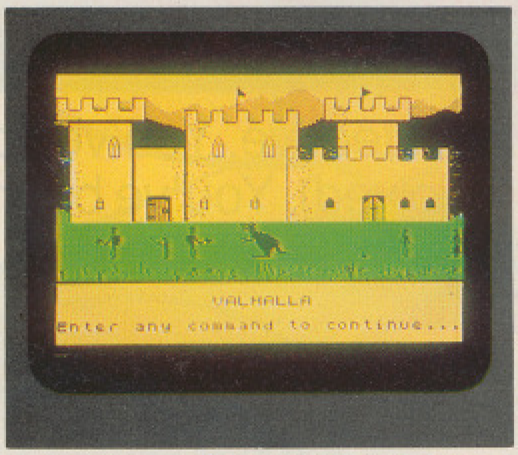
Loading the game is simplicity itself; it takes about ten minutes and you can restore a saved game if you want to. After that the choice is yours — get on with playing, or just sit back and watch the inhabitants of Valhalla go about their daily grind of battle after battle. The graphics are wonderful; detailed backgrounds are drawn quickly, and the characters themselves animated in the foreground. There's just one slight problem here — only a limited number of character shapes have been used, so, for instance, all the gods look exactly the same. When you first visit a location, a set of 'who's who' arrows appears under the picture, but as people move around you can end up very confused, and I had to issue the 'who' command frequently. A nice touch is the provision of a 'mono' command for those using a black-and-white television — this changes the colours of all the characters to grey, so you can see them clearly against the scenery.

Entering commands is also easy, as long as you remember that the sequence of a command starts with the object to be used, followed by the person you are talking about e.g. 'give the sword to Odin', not 'give Odin the sword'. Apart from this, the parser will accept virtually anything you care to throw in its direction — sequences of commands separated by commas, or even (slightly) misspelt commands. One snag is that you can issue commands during action by other 'players', but these won't be acted upon until the action is completed. This can mean sending another character a whole series of requests, for instance to give you some food, just after he or she has left the room. If you want to keep a record of your game, then besides the usual 'save' command which freezes the action and stores it to tape, there are 'print' and 'noprint' commands which, provided you have a Commodore printer attached to your machine, will keep a log of everything that goes on while you're playing.

In all, a very addictive adventure. Its writers call it a 'computer movie', and watching the screen, I wouldn't disagree. Buy it, and be prepared for some long, frustrating evenings tracking down your six quest items, with, seemingly, the whole world against you, and your every movement subject to the whims of the gods, goddesses and assorted Valhallans.



Skadi arrives to join Boldir, the raven and yourself. Maybe you could take this opportunity to get aggressive...



Some of the motley crew from Valhalla. The program is halted to stop them beating each other to death.

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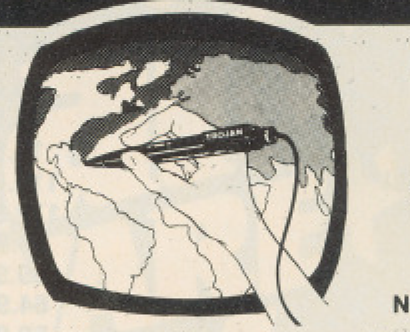
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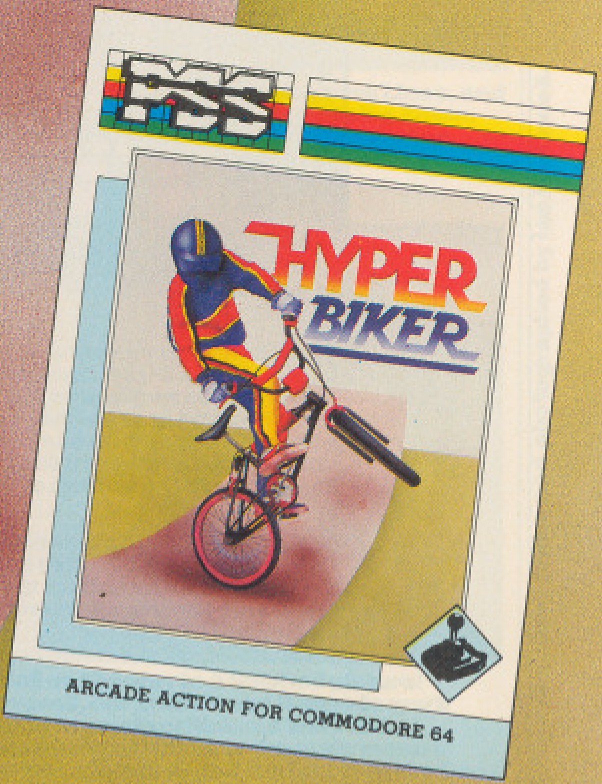
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DRAWING ON BEAR ESSENTIALS

The KoalaPad is a tiny digitising tablet which, together with the KoalaPainter software, enables full-colour pictures to be created, edited and stored on disk for later retrieval. Henry Budgett *puts on his artist's smock and wonders what Van Gogh would have made of it . . .*

Getting to grips with the 64's quaint system of graphics is something that the average user often feels is best left to the expert. The complexities of block graphics, high-resolution screen, multi-coloured user-defined characters and sprites, and dual memory map have been the subject of many magazine articles and even books. For the user who wants to create designs and drawings on the screen, whether for pleasure or profit, the easy answer is to buy a graphics package.

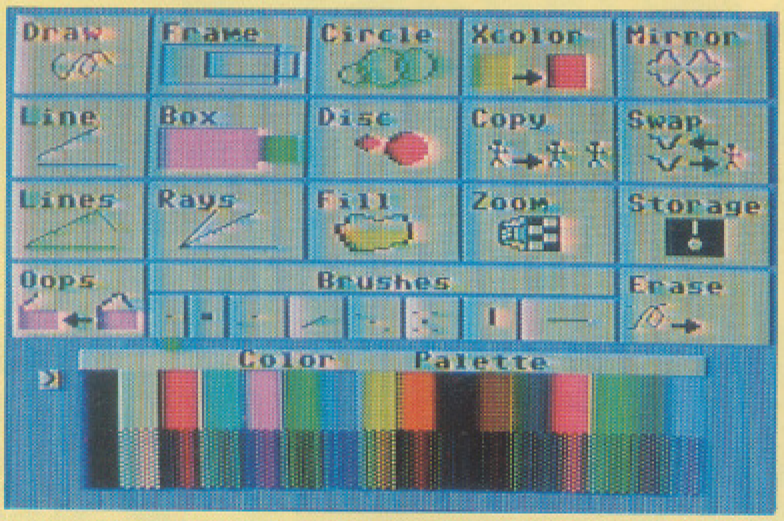
One of the nicer looking packages centres on a miniature digitising tablet called the KoalaPad. Based on the pressure pad system, the designers claim the added attraction that you can even use your finger as a stylus — which is true enough though the resolution achieved with such a blunt instrument is rather poor to say the least! The pad is housed in a sloping plastic case that connects to the computer by way of the joystick socket (Port 1). The front of the case is the pressure-sensitive surface and the top is equipped with two pushbuttons. Included with the tablet there's a plastic stylus, two manuals and a disk containing the *KoalaPainter* software, and some demonstration pictures.

Fitting the system to your 64 is as easy as plugging in a joystick — electrically that's exactly what the pad looks like to your computer. The installation instructions are contained in the smaller of the two manuals and are simple and straightforward. The same tablet, with appropriate connector, is used for each of five versions: Apple, IBM, VIC-20, Commodore 64 and Atari; that, however, leads to a minor problem in the tablet's usability, which I'll come to in a moment.

I used the disk version of KoalaPainter software for the review here; it's also available in cartridge form. Loading the program from disk is fairly straightforward: LOAD "KPAINT", 8 loads in the boot program which you then RUN to get the rest loaded. Many disk-based programs these days auto-load, and it would have been nice to have had this facility here. On the first attempt at loading, the program didn't even get as far as the title page, and a second attempt failed as well. Starting from scratch again I realised that the ever-faithful Mikro assembler was sitting in the cartridge slot; once removed, the loading problem was solved. Nowhere in the manual does it warn against having cartridges present . . .

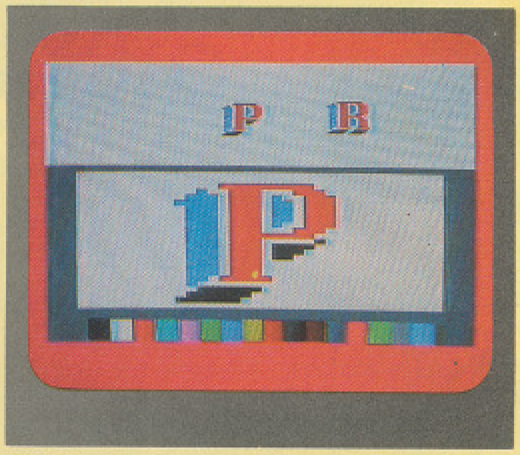
When it finally loads, (you can't blame Koala for the speed of the Commodore disk system), the title page appears as a brightly-coloured jungle scene. After a few seconds, this is replaced by the primary menu. As menus go, this one is

The Koala Pad in action



The Koalapad is extremely easy to use, all the features offered being selected from a single icon menu. To select the draw option, for example, use the stylus to move the cursor to the draw box and press either button, then move the cursor to the bottom of the screen and press the button again to execute the command. To return to the menu from a picture, simply move the cursor to the bottom of the screen and press the button.

At the bottom of the screen you have a choice of 'brushes'. These affect the thickness and shape of the line when freehand drawing but do not affect the Line function. Underneath the brush selection is the colour and texture palette. The range is limited but adequate.



The Koalapad does not have built-in lettering, so if you want words on the screen you'll have to draw them. These letters were drawn using the Zoom (magnify) feature.



Provided the boundaries are drawn carefully, using Zoom where necessary, the Fill routine is reasonably accurate, though odd gaps may need to be tidied up by hand.

excellent — all you need do is use the pad to move the pointer to the function you want to use, and then press either button to activate it. It's a neat, effective and well-conceived solution, but with one small problem: whoever went to the considerable trouble of designing the pictograms (icons if you're not up-to-date with the latest jargon!) that indicate the various functions blew it when it came to the labelling. When you select a function, its name flashes between black and red and this is not at all easy to see — even on a monitor; it should have been better designed. (Perhaps the pictogram could flash instead?).

The initial menu covers all the major functions and the colour palette selection. The palette contains sixteen solid colours and sixteen patterns (which can be made up from any of the sixteen solid colours mixed with the current foreground colour). The currently selected colour is highlighted by making it the border colour. A choice of eight brushes is available, ranging from a single pixel size, to edging and line shapes. The pictograms for the main functions make up the rest of the screen display.

To begin drawing, the stylus is moved to the bottom of the screen and either button pressed. The screen is cleared, revealing a fresh page ready for your latest masterpiece. In fact, there are two screens available for drawing and both whole pictures and selected parts can be copied between them. However, the drawing process itself highlights the limitations of the small tablet. The most obvious quirk is that the area of the pad corresponding to the picture area of the screen is very small — the rest of the pad is used to make new selections. That means job number one is to mask off the screen area on the pad with tape or something suitable. This smaller-than-expected drawing area has the obvious effect that a very tiny movement of the stylus corresponds to quite a lot of dots on the screen. Fortunately, the excellent Zoom command allows you to fine-edit to your heart's content once the basic shape has been created.

The next most visible limitation of the system is its total inability to draw circles! Well, to be fair, it does try, but the result is much more like an ellipse. There are only two obvious ways around this — either use the Circle or Disk function and then edit using Zoom (which is time consuming and fiddly) or buy an ellipse template and draw ellipses on the pad (which then look like circles on the screen!). Neither is exactly an optimum solution and the problem is inherent in the fact that the Commodore 64's pixel map isn't square; this, however, could have been taken into account by the software.

It's obvious that the designers of KoalaPainter put a lot of thought into the program. Possibly the single most interesting feature is the ability it has to create a 'rubber-banded' shape such as a Circle, Frame or Line and then more it around on the screen until correctly positioned — then fixing it in place. All of this occurs without disturbing anything 'underneath' the shape being transported which, while sounding obvious, is something that takes a lot of processing power and memory.

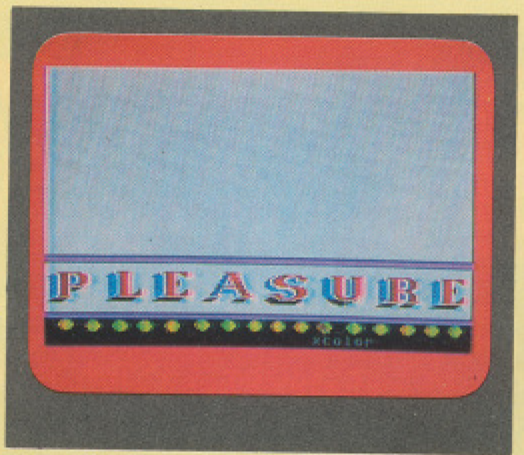
Most of the major functions work pretty well. Fill can leave the odd hole here and there but that's easily touched up by hand. The Undo option — cancelling the last thing you did — is extremely useful if your Fill leaked or your hand slipped.

The only area to give any real cause for complaint is the Storage function. Pictures are saved in a special format, to be read in as data files from disk; you can't transfer them into another program. This problem can be circumvented if you're using disks, because a short routine to load pictures is provided in the manual; but you'll have to re-write the program yourself if you're using tape. However, it's interesting that in the manual that came with an older KoalaPad (bought last November in New York) there's no mention of this at all. We contacted UK distributor, Audiogenic, and the company kindly supplied us with the necessary routine.

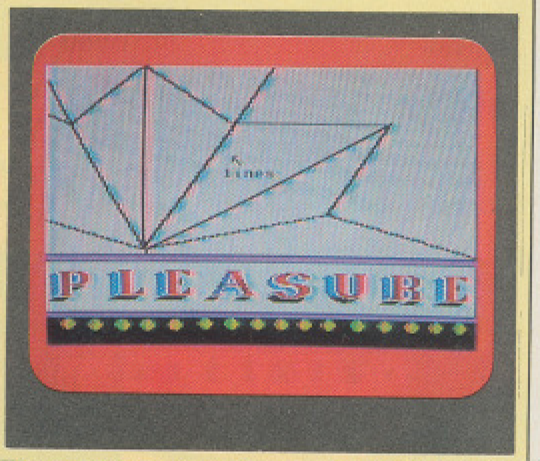
Still on the Storage function, I'm intrigued to know why no delete option has been included. You can format a disk, store and load pictures, but you can't delete a named picture file without scrubbing the whole disk. Nor can you save a picture onto tape or load from tape, which seems a little strange. The actual mechanics of the Storage option are beautifully done; you just use the stylus to select the function you require, click the button, point to the file name you want — and then click the button again to perform the task. It's as easy to use as a mouse in this respect. ▶



Once the letters had been drawn, the Copy function was used to position them to form the word PLEASURE. The Copy command was then used again to move the entire word down the screen.



The original word was boxed and Filled in white (the background colour). The thick lines were done by using Line to define the area, then Fill to shade it. The circles were done using Disk and then Copy to duplicate them.



The star shape was drawn using Lines, and then tidied up prior to Filling using Zoom. Lines can be moved around the screen before fixing into place — useful for drawing regular shapes.



The jagged shapes were again drawn using Line and then Filled after tidying with Zoom. Note that the border colour indicates the currently selected colour.



The area between the two jagged shapes was filled using one of the textured colours in the palette. The disks were again Copied. Copy can only duplicate a rectangular area, so the background to the disks was also copied.



Well on the way to a finished picture! Overall, our artist found it easy to work with; his main criticisms were the necessity to return to the main menu to select a function and the fact that the Copy feature cannot copy an irregular shape.

Picture sequence drawn and photographed by Ian McKinnell.

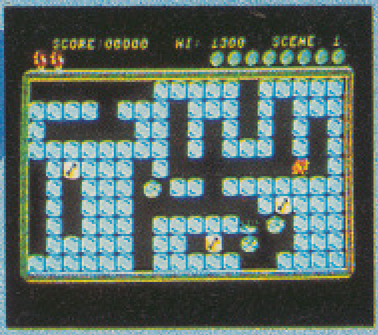
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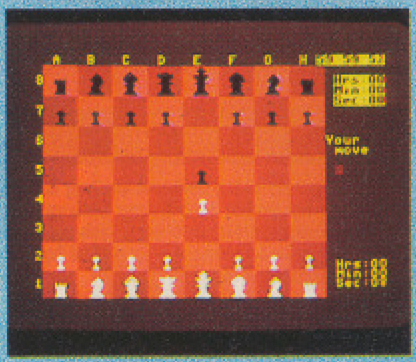


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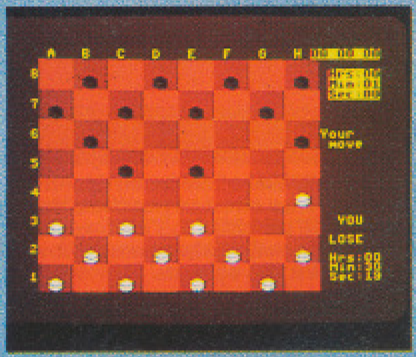
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DRAWING ON BEAR ESSENTIALS

The manual is quite good. The only area that gets a bit muddled is the description of how to copy parts of pictures between the two screens; still, a bit of practice soon sorts this out. The manual that came with the review KoalaPad was a great improvement on the copy that accompanied the system bought last year; could it be that someone over there actually listened to the comments of a reviewer?

Because the KoalaPad simply emulates the joystick or games controller, it's possible to interrogate the device from Basic or machine code, should you wish to. And if you want to play joystick-based games using the tablet, you can (although it seems a little pointless unless the game is designed with this in mind). The two buttons are not individually addressable and they perform exactly the same function. They're provided so that left- or right-handed people can operate the tablet with equal ease.

It would be churlish to regard the KoalaPad as anything other than an excellent product. The hardware and the software perform extremely well within the constraints of the 64, and I've yet to see anything based on a digitiser to, er, touch it. My only major complaints are that the tablet area is really too small for convenient use, and that it can't save pictures to tape; perhaps, too, a second-generation KoalaPainter program will take advantage of the low-cost, colour ink-jet printers that are now available (but which weren't around when the original was written).

But enough of the carping, for there's one seal of approval that you just can't knock. The software department where I work has been using one steadily since last year to produce on-screen images for 64 programs — and that's a good enough recommendation for me.

COMMAND SUMMARY	
Draw	On-screen cursor follows the movement of the stylus. A line is drawn while either button is held down.
Frame	Creates 'rubber-banded' boxes from starting point to current cursor position. Transportable.
Box	Filled-in Frame.
Circle	Creates a 'rubber-banded' ellipse from starting point to current cursor position. Transportable.
Disc	Filled-in Circle.
Line	Draws individual straight lines from starting point to current cursor position. Transportable.
Lines	As Line, but allows new line to start from the end of the last.
Rays	Draws lines from a single starting point to the current cursor position. Of dubious value.
Fill	Fills any enclosed space with selected foreground colour.
Oops	Undoes last operation. Very useful!
Xcolor	Exchange any one colour for another throughout the picture.
Mirror	Creates reflected images of the design being drawn.
Zoom	Splits the screen. Top third shows selected area real size, bottom section is magnified four times to allow fine editing. Essential!
Erase	Erases whole drawing.
Copy	Copies the area within the frame to any other location. Can be used to transfer between the two screens.
Swap	Switches between the two screens.
Storage	Allows screens to be saved onto or loaded from disk.

MACHINE CODE TUTOR ASSEMBLERS

Andrew Bennett continues his definitive guide to machine language programming on the 64.

Last month we looked at what we mean by machine code, explained how the hexadecimal numbering system works and introduced the concept of an assembler. Before we can progress any further, you'll need to go out and buy an assembler. To help you in this task, we're devoting this month's Tutor to examining assemblers in detail.

Let's start with a quick recap on what we covered last month. Machine code, or machine language, programming *per se* is performed in hex. Code produced by hex programming is very efficient in execution but extremely complex to write — even simple tasks like adding two numbers together have to be coded step by painful step. High level languages (like Basic), in contrast, are much easier to work in than machine code, but the programs produced run very much more slowly.

Assembly language, or assembler, is a compromise between Basic and binary programming, and it's what most people mean by machine code. Assembly language, like hex programming, allows us to control the processor directly, but uses three-letter labels (like JMP) in place of hex instructions. The job of an assembler is to convert our assembly language labels into hexadecimal code.

OK, that brings us up to date with the resumé . . . now let's progress. Assembly language code consists of two parts: an instruction (a three-letter label) and a hexadecimal address (memory location). The instruction tells the 64 to do something to the address.

Just as you can use variables in Basic (ADRS=52000:PRINT PEEK(ADRS)), so too you can use variables in assembly language. Thus you could define a variable 'screen' and use the variable instead of the address (in the case of screen RAM, $0400). Confusingly, assembly language variables are known as labels since they are nothing more than labels given to a particular memory location.

Assemblers that allow the use of labels in this way are known as 'multi-pass' assemblers, because they have to go through the source code more than once; the first pass normally checks the syntax, the second inserts absolute values in place of addresses and the third assembles the code.

The assembly language code you write is not directly understood by the processor any more than Basic is. The assembler has to assemble your code into its equivalent machine language. The assembly language is thus known as the source code, and the machine language itself as the object code. Thus you get the speed and efficiency of machine code without the hard slog of grappling with hex notation.

Most assemblers intended for serious use store the source code in memory, and only assemble it into machine code when you tell them to. Prior to being assembled, some of the better assemblers allow the source code can be freely edited exactly like a Basic program, using the 64's standard screen editor. Most assemblers even support line numbers to make editing easier. This type of assembler is described as a 'full' assembler in the comparison chart under the column headed 'Type of Assembler'.

However, there is a simple form of assembler which doesn't store your source code in memory at all, but assembles directly into machine code as you go. This type of assembler, referred to in the chart as 'simple', makes editing impossible. Simple assemblers are easier to use when you're first learning to program in assembly language, but they're all but useless once you've become more experienced (imagine a Basic which didn't allow you to edit program lines!). Simple Software, incidentally, has to go and confuse things by producing a full assembler called *Simply Assemble*: this is, of course, not a simple assembler!

Part 2: Assemblers

- What is an assembler?
- What is a monitor?
- What to look for in an assembler
- Mini-reviews of assemblers for the 64
- Our at-a-glance assembler comparison chart

Y64 recommends that you buy a full assembler. Simple assemblers may be easier to deal with at first, but you'll only have to go to the expense and trouble of buying and learning to use a full one later. You might as well get it over with and buy a full assembler right at the start.

Because an assembler is itself a program, it of course takes up memory. The amount of memory left to the user is 64K minus the program size of the assembler, minus the workspace it requires. This figure is given in the chart under 'User RAM Available'.

There is, however, another factor to be taken into account as regards user RAM. Some assemblers allow you to split your source code into several smaller programs which are stored on tape or disk — and called by the assembler as necessary during the assembly process. This technique is known as linking files, and you can see which assemblers support the feature in the chart under 'Supports Linked Files'? Note that simple assemblers obviously cannot do so, and are marked N/A.

Another useful facility is for the assembler (and your source code) to be able to coexist with Basic. This means that you can jump into Basic, perhaps to PEEK a memory location in order to find out its normal value, and then jump back into the assembler. Of the assemblers known to us, only Supersoft's *Mikro* has this ability.

Some assemblers contain built-in monitors. Monitors are programs which allow us to quickly and easily examine the contents of any part of the machine's memory. Monitors generally use one-letter commands followed by an address, in a very similar way to assemblers. Some monitors include assemblers as one of their commands, and indeed Handic's *Mon 64* and Commodore's *Supermon 64* are really sophisticated monitors which contain assemblers, rather than the other way around!

Other commands provided by monitors include <H>unt for a particular value <F>ill an area of memory with a specified value and <D>isassemble. Disassembly is, of course, the opposite of assembly, and it lets you examine machine code in an easily understandable (well, fairly!) form. Monitors can be very useful for debugging and perfecting machine code programs after assembly.

The final term we need to understand before we look at the assemblers themselves is 'makro'. No, it's not a row of Scotsmen, it's an assembly language subroutine (or, more accurately, a procedure) which can be stored on tape or disk and then retrieved later for use in another program. None of the assemblers reviewed here support this rather useful feature, but makros are only of real use to experienced assembly language programmers.

So far, so good. Now that we understand what the features mean, let's take a look at the different assemblers available on the 64 and see which support what. This list probably isn't comprehensive, but it does include all the companies we knew about who could be bothered to send us a copy of their assembler when we asked them nicely.

The general rule, as with most things, is to buy the best you can realistically afford:

A COMPARISON OF FULL AND SIMPLE ASSEMBLERS

Simple assemblers are easy to use as they have few commands. They can be less trouble to use when writing very short routines, but are not suitable for longer programs because of the lack of editing facilities. Full assemblers are often (though not always) more complicated to learn, but offer full editing facilities. They may also include aids to assist in debugging assembly language programs. Most experienced assembly language programmers will use both — a simple assembler to experiment with (to test out new ideas), and a full assembler for serious work.

SIMPLE ASSEMBLERS

A simple assembler assembles each line as it is typed in. The resulting machine code program can then be run and saved to tape or disk for later loading. Because the source code is not stored in memory, it is not possible to edit the code, though it can be overwritten.

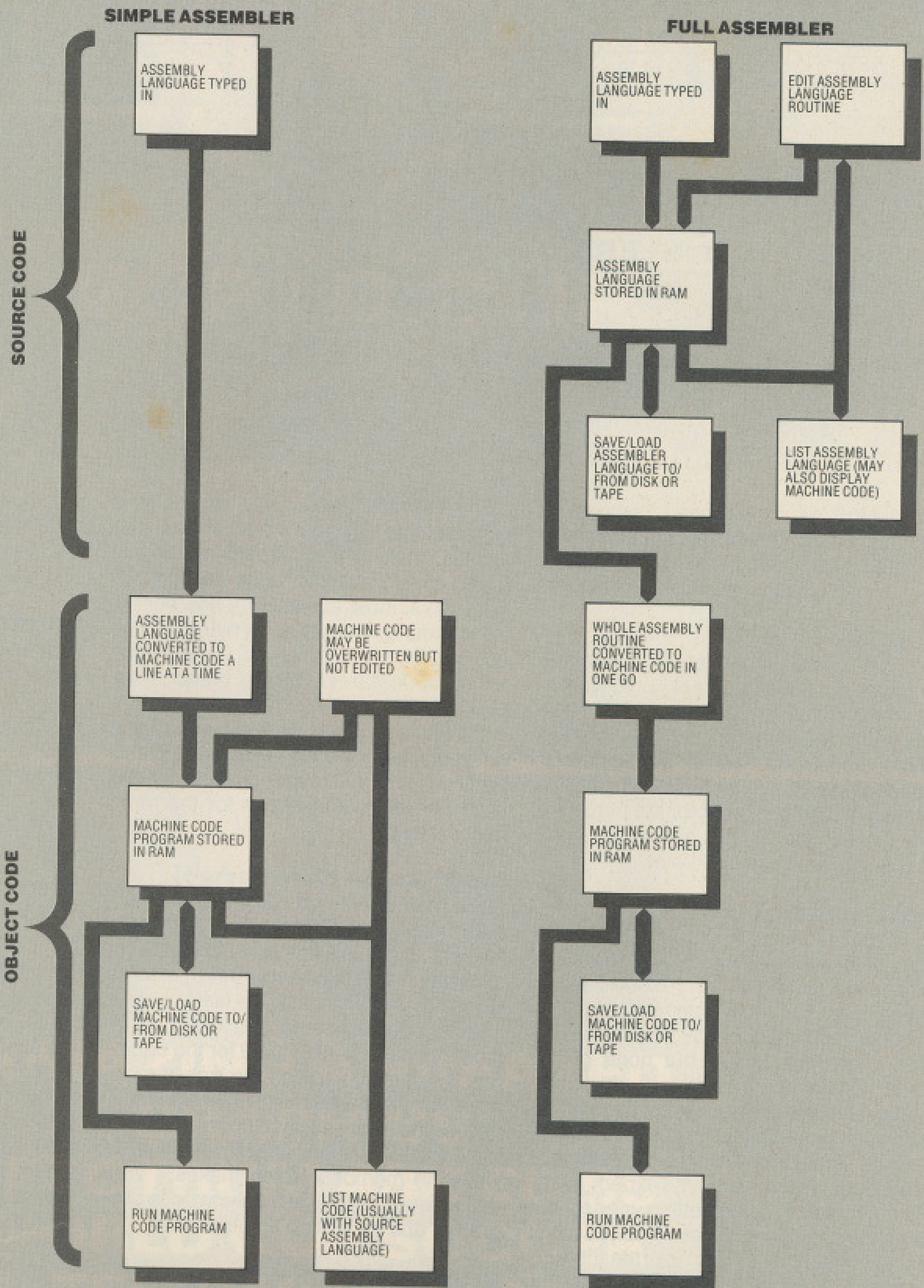
When a simple assembler is asked to list a program, it is able to list the object code straight from RAM. Some simple assemblers also list the source code; they do this by disassembling the object code.

FULL ASSEMBLERS

A full assembler stores the assembly language source code in memory as you type it in. It does not turn into machine code immediately.

This source code may be freely edited, sometimes using the 64's full-screen editor just like a Basic program. The source code may be saved to tape or disk, allowing you to save partly-completed assembly language programs for later editing and completion. Some full assemblers also allow you to merge assembly language subroutines so that you can build up a library on tape or disk.

Once you have finished writing the program, and saved a copy of the source code, you can then assemble it into machine code. This object code may then be saved to tape or disk and run. If the program needs debugging, you would normally go back to the source code and edit this.



MARK WATKINSON

a programmer is only as good as his assembler!

Mikro Assembler (Supersoft)

The most expensive of the assemblers reviewed here, Mikro, is very well written and a good performer. It eases the transition between Basic and machine code by allowing source code to be entered like a Basic program, with line numbers.The program can then be edited using Commodore's excellent screen editor — allowing lines to be added, deleted and moved around in the usual way. To help this process, the designer has included DELETE, AUTO and FIND commands. These can also be used with normal Basic programs — a nice touch. My criticism of Mikro is its present lack of a renumber routine. However, Supersoft will soon be publishing one in the form of an add-on program.

Mon 64 (Handic)

Mon 64 is a monitor that includes a simple assembler. Unfortunately, I found the review copy particularly difficult to insert into my 64, probably because the printed circuit board inside was loose. I hope this was a 'feature' of the review cartridge only. The monitor itself is comprehensive and includes many extras, including some very useful commands. On top of the cartridge are two small switches that

QUICK CHECK LIST AND SCORE CHART

	PRICE & FORMAT	MONITOR INC	CO-EXIST WITH BASIC?	SUPPORT LINKED FILES	FROM A BASIC PROGRAM?	USER RAM AVAILABLE	Y64 RATINGS BEGINNER USER	EXPERT USER	DOCUMENTATION	
FULL ASSEMBLERS										
MIKRO SUPERSOFT	CART. £57.50	●	●	●		30K	9	9	8	Expensive, but comprehensive and easy to use. Probably worth the money if you can afford it.
SIMPLY ASSEMBLE SIMPLE SOFTWARE	DISK. £22.00 CASS. £22.00			●	●	27K	7	6	8	The cassette version is too slow to be recommended, but the disk version is worth considering
ZEUS CRYSTAL	CASS. £9.95	●		●		38K	9	8	8	Fast and comprehensive — and at £9.95 we can hardly fail to recommend it.
PULSE INTERCEPTOR	CASS. £9.95					13K	7	7	6	The low price means that this must be worthy of consideration, but is only really suitable for beginners.
SIMPLE ASSEMBLERS										
MON 64 HANDIC SOFTWARE	CART. £39.95	●		N/A		N/A	6	6	7	Includes many useful extras, and is convenient — if not particularly easy to use.
ZOOM SUPERSOFT	CART. £28.79 DISK. £13.50 CASS. £11.50	●		N/A		N/A	7	6	8	Not recommended for beginners, but has every feature the more experienced user could ask for.
SUPERMON 64 COMMODORE	DISK £14.95	●		N/A		N/A	7	6	6	Very easy to use, but not as powerful as most of the others reviewed here.

allow Mon 64 to be used with, or to replace, Basic. Overall, it's not as easy to use as I would have liked, but still a good buy — particularly if you like cartridges.

Zoom (Supersoft)
Zoom has just about every feature that a machine code programmer could want in a monitor/simple assembler. It's also been designed to work with Supersoft's Mikro assembler as a development/debugging tool, but it can be used too on its own. It's probably not for the beginner, but it might be worth considering once you're feeling more confident.

Pulse (Interceptor)
A cassette-based assembler that's the cheapest reviewed here, and therefore one to be looked at very closely (even though I did tell you to spend as much as you can afford!). Source code is edited very much like Basic, but none of the usual Basic commands are available. Labels are only allowed to be up to two letters long, and this feels rather restricting. It uses semi-colons where, in assembly language, you'd normally expect commas. This takes some getting used to, but if you're a beginner, presumably it won't be a problem. But I feel, too, the instructions for Pulse lack sufficient detail; for instance they give no information on how the assembler uses memory. Overall, I can't really recommend Pulse — because the chances are you'll have to buy another assembler once you've become more experienced.

Simply Assemble (Simple Software)
Available on disk or cassette, Simply Assemble splits up into several parts — including an editor (for the source code) and assembler. Assembly demands a considerable degree of disk or cassette access, making the cassette version in particular difficult and time-consuming nowadays, most assemblers and editors are permanently resident in memory. The assembler does, however, have some attractive features. One of these is the ability to join your machine code onto a small Basic program, so you can load and run your machine code like a normal Basic program. It's not recommended for the beginner, but worth a look for the more experienced.

Supermon 64 (Commodore)
Supermon comes on the programmers' utilities disk from Commodore, and some readers might already have bought it in this way; it's also available through some club libraries. The package lacks quite a few of the extensions that many other monitors have, but it's ideal for the beginner. It's easy to use and the lack of more powerful commands allows beginners to get used to it very easily. Supermon is fully relocatable (that is, it can reside anywhere in memory) which makes it very useful for editing large machine code programs, and for writing small ones.

Zeus 64 (Crystal)
This is by far the quickest assembler reviewed here. It's able to assemble most programs in the blink of an eye and these lightning results are only slowed down by particularly long programs. A monitor (with lots of added commands) is also included, and the assembler features a useful crop of extensions, making it very comprehensive indeed. Source code is edited in much the same way as a Basic program, and additional editing commands are available — such as 'search and replace'. At £9.95 I can hardly fail to recommend it. Zeus may not be as easy to use as Mikro, but for beginners, its low cost does a lot to close the gap.

```
100 HEX$="0123456789ABCDEF"
110 INPUT "███INPUT DECIMAL NUMBER ";D:PRINT"█HEX NUMBER = $";
120 FORI=3TO0STEP-1:G=INT(D/(16↑I)):D=D-G*16↑I:PRINTMID$(HEX$,G+1,1);:NEXT
```

Y64's two-line decimal to hex converter

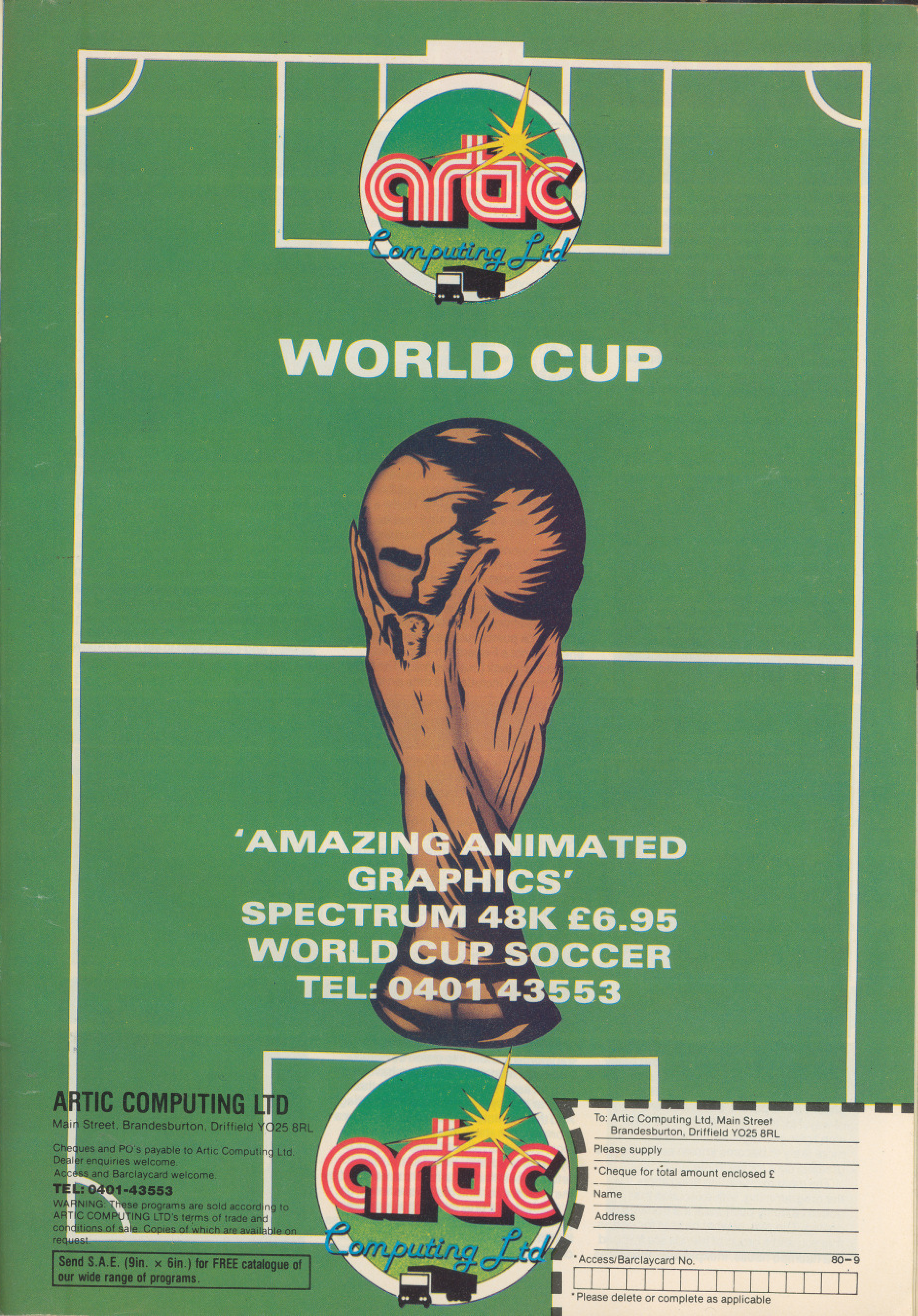
Looking Ahead
Next month at last we try our hand at some real machine code programming. There's no homework this time, but my advice is that you get down to using your new assembler. Try typing in any programs given in the manual, even if you don't fully understand them. That way it won't get in your way when you begin writing your machine code masterpieces.

SPECIAL OFFER TO Y64 READERS!
To ease the pain of having to part with your hard-earned cash in exchange for an assembler, *Y64* has arranged the following special offers.

Interceptor, Crystal and Simple Software have each kindly agreed to offer Y64 readers a 10 per cent discount on their assemblers. If you choose one of these, simply cut out the coupon below (not a photocopy), deduct 10 per cent from the price shown and send payment with your order to the supplier.

Alternatively, if you choose *Mikro*, Supersoft will throw in *Zoom* on either tape or disk free of charge (again, please enclose the coupon with your order).

THE COMPLETE Y64 MACHINE CODE TUTOR
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*Please delete or complete as applicable

ACTION REPLAY

INTERDICTOR PILOT

Supersoft £17.95 (tape); £19.95 (disk)

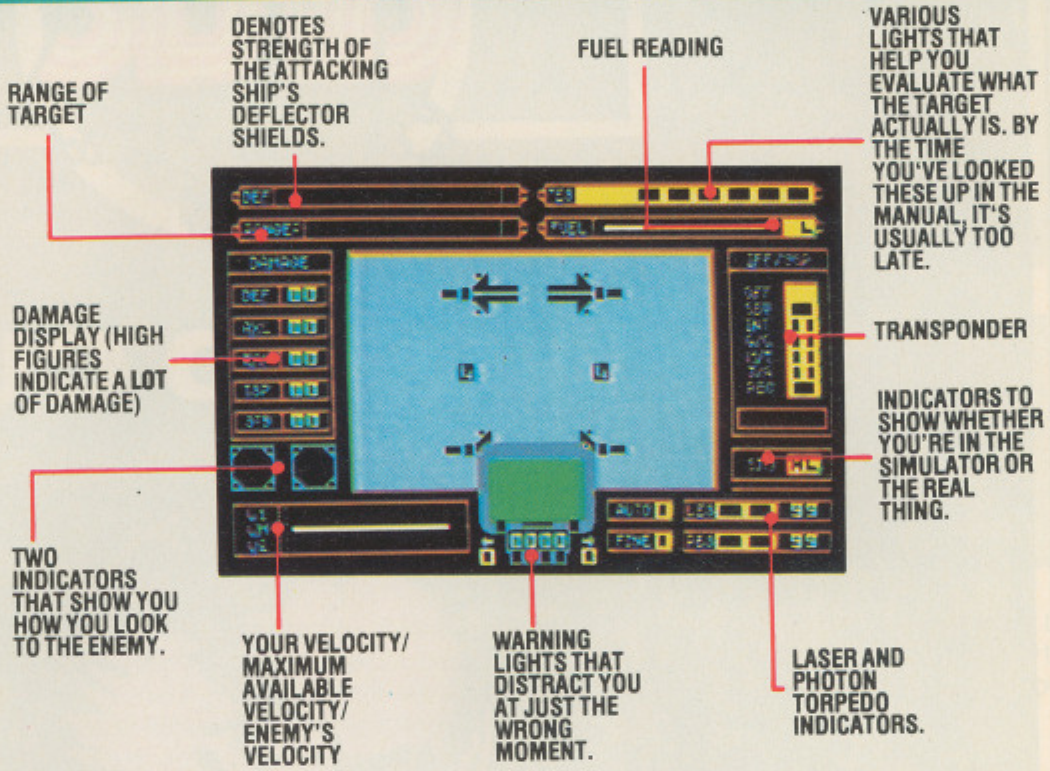
CLARK'S CLASSIC

This is not your average flight simulator, but an inspired game of skill written by an RAF pilot (and does it show!). You and your Interdictor Mk III must destroy the enemy forces — a task which involves a series of perilous missions.

The screen display illustrates your instrument panel and by far the most important item on it is the transponder — which transmits and receives the identifying signals of the assorted spacecraft that you'll encounter in space; without that you've no way of telling whether a target found by your computer is an enemy fighter, cruiser, or another Mk III.

Just to confuse matters still more, the Mk III can fool the enemy by simulating the identifying codes of other ships, transmitting like an ally until the prey falls into laser range. The enemy has a wider range of weapons than the Mk III, so this devious tactic stops him getting too cocky. Of course you've still got to take the risk that your target really *is* an enemy, and not just another Mk III in camouflage!

Your sorties begin with blast-off from the Starbase tunnel, and end (hopefully) with a successful return to your destination Starbase. This is probably the most treacherous task of all as you have to approach on the correct flightpath or the Starbase will shoot *you* down! If all goes well, you're debriefed and your career record updated.

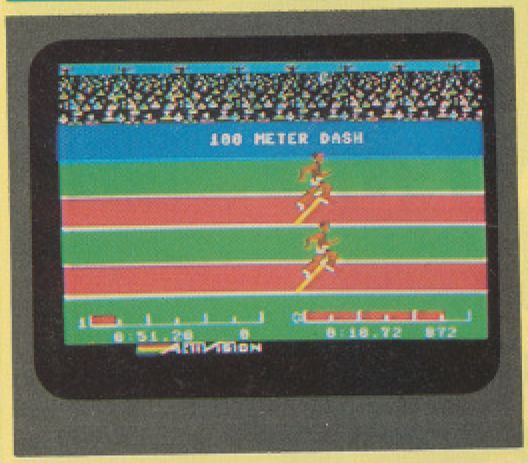


With the game, you get a superb 50-page manual containing all the information you could ever need. For example, one of the memos from your boss at the beginning of the book points out that ramming an enemy is not a Federation-approved method of attack (but it works!). The back of the manual includes full data on the specifications of the ships you will meet in the game; experienced pilots can learn to distinguish spacecraft by, for example, their acceleration rates.

All in all, *Interdictor Pilot* has the style, realism and excitement to set it way above the rest.

DECATHLON

Activision/£9.99



Your ability to waggle a joystick from left to right as quickly as possible may win you the gold medal in this Olympic game based on the decathlon.

Taking the pole-vault as an example, the computer calls you to the track when it's your turn to vault. The crowd quietens as you take a grip on the pole and prepare to run. Setting off as fast as you can, just in front of the bar you jab down the pole (by pressing the fire button) and lever yourself over the bar; hitting the fire button again releases the pole. If all goes well, the bar is raised and the competition continues.

You can win a maximum of 1000 points at each event, and up to four players can compete in this excellent game... although track events are only run between two players at any one time. Those thinking of buying it are recommended to get in some joystick practice; winning the 1500m involves waggling the stick at breakneck speed for about four minutes! It might sound easy but, believe me, it's not.

What also score here are the quite superb graphics; as far as sporting software is concerned, *Decathlon* is a gold medallist in the games stakes in its own right. Superb!

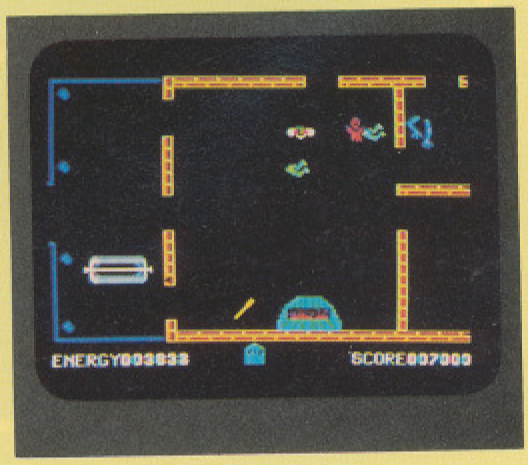
THE EVIL DEAD

Palace Software/£6.99

Palace Software is an offshoot of the film company that brought you the video nasty of *The Evil Dead*. It's hardly surprising then that the game of the same name is just as ghastly as its parent, but in a different sort of way. No, it's not particularly gory; no, it won't give you nightmares. Actually, it's more likely to become known as the world's greatest cure for insomnia.

The most excruciating thing about it is the programming, with execution that doesn't exactly push back the frontiers of coding. The plot, or what passes for one, is that you and a group of friends are trapped in a haunted house. Inexplicably, the forces of evil take over your compatriots, transforming them into green coloured, bug-eyed monsters; these you have to kill with an assorted array of weapons that appear as if by some weird primeval magic. And there's more! For when you clobber a monster, it shatters into sections (arms, legs, etc) which all start attacking you, bit by bit (so to speak). Killing all the 'bits' returns your friends...who are unscathed by the experience, and ready for another go.

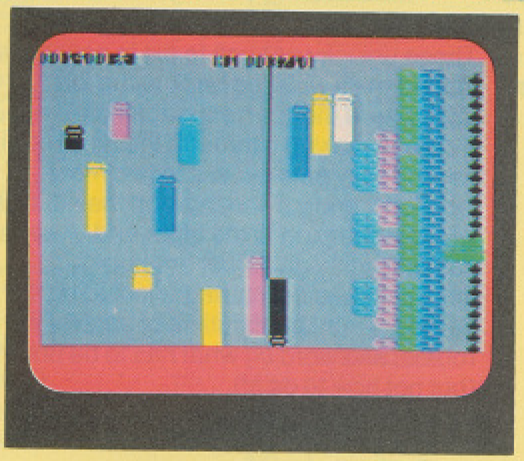
Actually, the only evil thing about this game is having to play it — and at the press launch, you couldn't even do that. Palace's only copy refused to load!



ACTION REPLAY

SPY SCHOOL

Dimension 21/£5.95



Let's all welcome the first game for the 64 from a new company called Dimension 21. It presents two levels of four tasks that you have to perform successfully if you're to become a fully qualified spy — and you can take them in any order you like. There's Sniper, where you've got to shoot down all the helicopters swarming around you; Sabotage, which sees you destroying an enemy base as you overcome a series of frogger style obstacles; and Burglary, where — guess what — your task is to steal a suitcase from the bottom of the screen (tripping any of the alarms will trigger two giant doors that trap you). And, finally, there's Escape — five screens of obstacles which you have to pass through from one side to the other; one bright idea here is a maze that's only visible for a few seconds.

As soon as you've completed a task, you're picked up by a helicopter, and once you're through all four, up you go onto Level Two (same tasks, only harder). Overall, its; a very neat debut to the 64 games market.

TALES OF THE ARABIAN NIGHTS

Interceptor Micros/£7

Tales of the Arabian Nights tells the story of Imrahl the Kalender prince in his quest to find and free the Princess Anitra from the evil Sultan Saladin.

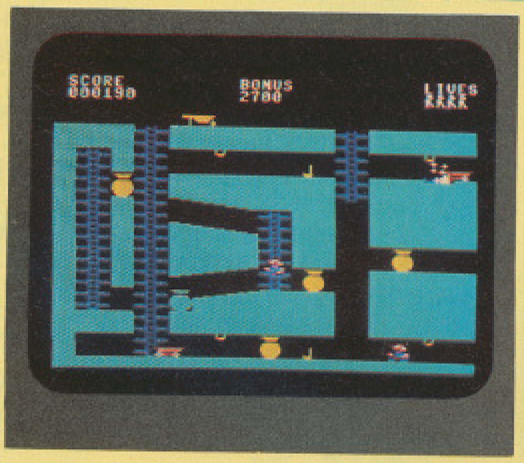
Each successive screen equals a night in which you have to accomplish some task. Most involve you in locating a series of jugs with letters embossed on them — which when collected on the right order spell the word 'Arabian'. Naturally, most screens present a full complement of octopi, birds, soldiers and cannons, all hell bent on killing you. But what puts this game light leagues ahead of the rest of the joystick fodder are the superb sound effects; Interceptor has even managed to generate speech without any additional hardware. Granted it sounds as if a whole family of frogs has moved into the speaker's throat, but it's still recognisable.

The speech is used to announce each night, and once the action has begun, the normal kind of sound takes over. Could this be the start of a new 'soundtracking' trend? Whatever, *Tales of the Arabian Nights* is a good game, made all the better by its ingenious sound effects,.



GILLIGAN'S GOLD

Ocean/£6.90



Gilligan's Gold is a maze game with sufficient additional features to set it apart from the normal breed of *Pacman* variations. It's set in a goldmine where you (Gilligan) have to collect the bags of gold and put them in your wheelbarrow. Sounds suspiciously simple, doesn't it? But be warned, because this goldmine is a highly dangerous place where you're constantly dodging armed bandits, deep mine shafts and runaway trucks. You can jump from handles in the ceiling into the trucks to ride through to another part of the maze, and move around through the mine passages, up ladders and even by lift.

Time is short — you've only got 4000 time units in which to collect all the gold. Fortunately you get another 4000 units for every bag you manage to put in your wheelbarrow, so it's important to keep your barrow close at hand and not waste any time. You'll quickly find ways to avoid the bandits, or even better, stun them. The easiest is to grab a pickaxe (unsubtle, but effective), though dropping bags of gold on them from above works too.

Keen fanatics will soon spot more than a passing resemblance to several previous games. Despite all that, it's an amusing combination.

FOOTBALL MANAGER

Addictive Games/£6.95

Formerly available only on the Spectrum, this has caused players many a sleepless night as you, the hapless manager, attempt to steer your team out of the Fourth Division and towards dreams of cup glory.

Once you've selected the team from your squad of players you're presented with the highlights of the game. This is where you really sweat it out, because you sit there helpless as your team attacks and defends. The number and success rate of your goal attempts depend largely on the relative strengths and weaknesses of your team compared to the opposition. And that's not all, because your team's morale — and a fair slice of luck — makes all the difference between your forwards neatly slotting the ball into the net, or shaving shots past the post.

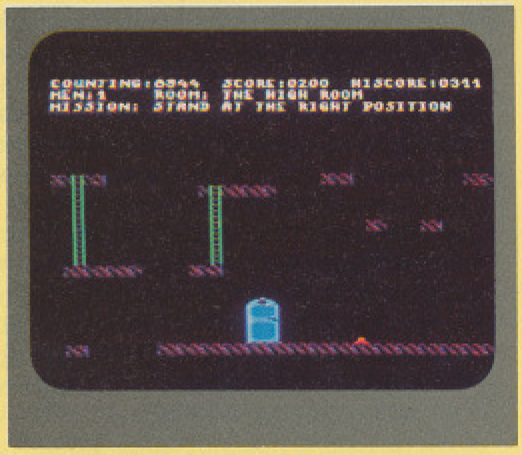
The decisions involved here may be simpler than those facing players of *The Boss* (reviewed last issue); somehow though, this game conveys more atmosphere. Maybe it's the fact that you're playing against 15 other teams in each division that adds depth to the game — or perhaps it's the graphic match highlights that capture the imagination; either way, this is the best football manager program available.



ACTION REPLAY

HOUSE OF USHER

Anirog/£6.95



The House of Usher is actually one of Edgar Allan Poe's more gruesome stories; this version, however, bears more resemblance to *Manic Miner*.

The game starts with a marvellous animated sequence that sees our hero slip out of the horsedrawn cart and walk up to the said house. Inside, he finds himself in a lobby leading on to nine other rooms — all containing *Miner*-style tasks. These can vary from just getting through the room, to collecting strawberries. Players are advised to dust down all their old *Manic Miner* techniques... above all, quick reactions and a keen sense of timing as they leap from one danger to the next. Those unlucky enough to die in action are immediately whisked back to the lobby, from where they can start again.

Those making it through the nine rooms will find they gain access to two more, labelled x and y. From now on their curiosity will spur them on to the bitter end. A simple cassette inlay gives just enough information to get started... including the names, a very brief outline of each of the rooms, and word on what has to be done (but not how to do it!).

BLUE THUNDER

Richard Wilcox/£6.95

A game based on the film of the same name (and not that awful television series). In it you captain the super helicopter Blue Thunder in a series of five missions.

Mission One is the easiest to accomplish and consists of flying Blue Thunder past an island sprinkled with enemy gun emplacements, radioactive clouds and armed airships. Your goal is to destroy a nuclear reactor that's protected by a moving shield (which is easily shot up) and an indestructible gun position (luckily that only fires intermittently); thus you must carefully time your raid on the reactor in order to bomb it without facing lethal retaliation.

Once you've razed the target you can choose whether to run for home or rescue the people stranded at the smashed reactor. The noble course is naturally very dangerous, and any foolish bravery is rewarded by the arrival of a balloon which bombs all those unable to get out in time.

After an equally eventful journey back to your home aircraft carrier you're ready to start the next mission, which includes such horrors as deadly submarines and heat-seeking missiles.

Blue Thunder is best controlled with a joystick, and while it's no simulation, it's fun.



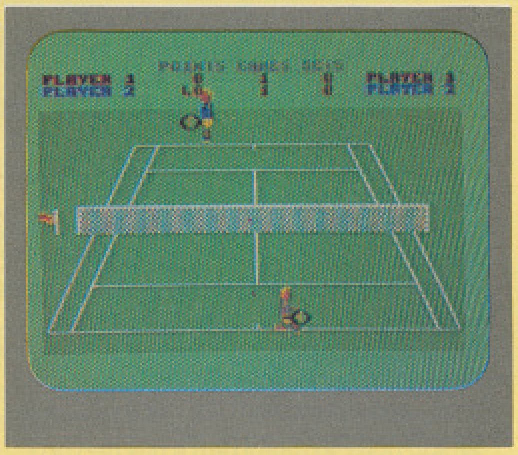
WIMBLEDON 64

Merlin/£7.95

Merlin describes *Wimbledon 64* as the "best sports simulation ever conceived"; such modesty, methought, deserves a thorough once-over, so here goes.

It features two characters (looking like refugees from Commodore's *International Soccer*) who knock a football-size tennis ball round a tennis court. Each player's joystick controls a budding McEnroe in a game that can be played up to three sets in length, at two different speeds and using one of four levels of skill.

But the real appeal lies in the control you and your joystick have over the ball... a subtle movement can send a lob or smash either back- or forehand across the net at a variety of speeds, even deflecting the ball to left or right.



Wimbledon 64 is going to be one of those games that's thoroughly enjoyed by two players of equal ability — and hated by the rest. You can forget about it being the greatest sports simulation ever — you can't even play a five-set match! And come to that, where are the ball boys, umpire and crowd? All are sadly lacking.

The real imponderable here is whether the 64 in the title refers to the Commodore 64, or to the year 1964... just take a look at the length of players' shorts!

BEST OF THE REST

Daley Thompson's Decathlon from Ocean (£7.95), not to be confused with the (in my opinion) superior **Decathlon** from Activision, is more like the arcade game **Track and field** and you can be disqualified after only four events if your score is under par. For my money Activision still gets the gold, but this one comes a close second.

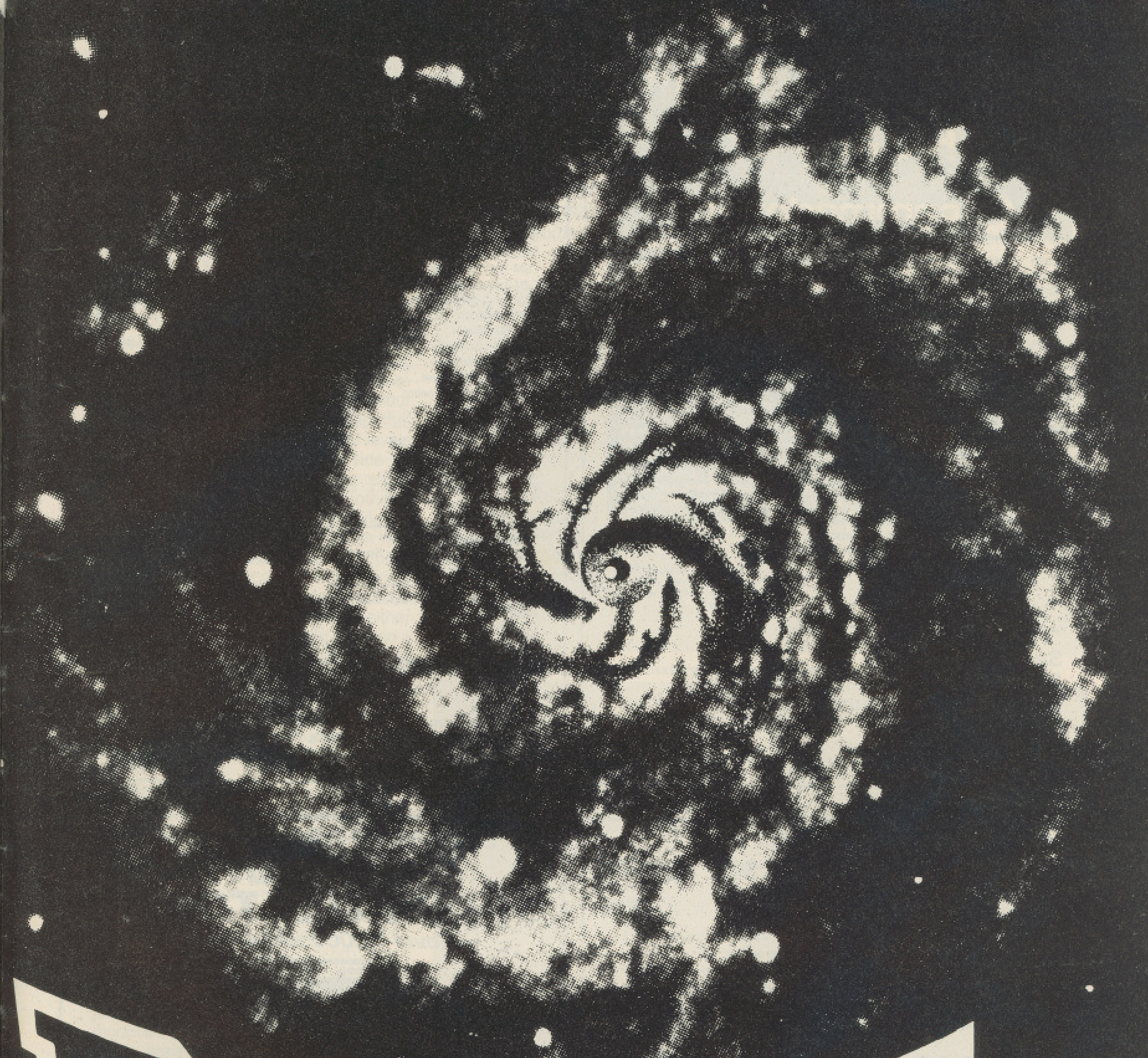
If you're after quantity and aren't too fussy about quality look no further than Cascade's **Cassette 50**. You get 50 games for £6.95 (about 14p each). They may not be brilliant but they're as good as some of the programs you find in magazines.

Beamrider from Activision (£7.95) will appeal to those who like it fast and furious — a grid-type game where you blast the nasties coming at you at an alarming rate. For well-oiled fingers only.

Mogul's **Zeta 7** (£7.95) has you manning a defence sphere and destroying marauding aliens (now where have I seen that before?) Can be amusing but that's about as far as it goes. The same can be said of their other release, **Murphy**, which is little more than a poor man's **Gilligan's Gold**.

A big hand for Phoenix Software whose **Quest for the garden of Eden** is an ingenious combination of arcade game and adventure — when you score in the arcade game you earn clues to help solve the adventure. All on one cassette and great value at £7.95 instead of the old-style double cassette packs.

And finally, an impressive start for the new company Talent Software in Glasgow who present **Kalah**, a computer version of the ancient shell game Macala, and **West**, a Wild West adventure where you'll need extra quick-draw sure-fire reactions for the all-too-frequent gunfights. When you die, you're resurrected (handy) allowing you to reclaim your possessions from your own corpse... personally I found the major hazard was tripping over my own body...



RACE

MOVI SOFT 2

DISTINCTLY SHADY

Have you ever envied the range of colours Atari programmers have at their disposal? Covet no more! Keith Bowden *extols the virtues of colour-mixing, and goes on to wax lyrical on the heady delights of anti-aliasing techniques . . .*

It's an unfortunate fact of life that the colour resolution of the 64 is not as good as it should be — certainly on models with early versions of the VIC chip, and particularly when you hitch it to a television rather than a monitor. There are two main reasons for this. Firstly there are only three 'grey levels' (other than black and white) associated with the 14 available colours; you can see these by displaying all the colours on the screen simultaneously, then turning the television colour control right down. The result is that colours which have different grey levels can be satisfactorily displayed side by side, whereas those sharing the same grey level tend to blur into one another.

The other problem is that if a series of vertical stripes are plotted down the screen, one pixel wide and one pixel apart, you'll produce an effect known as 'chroma distortion'; alternate character squares across the screen will have either a red or a green tinge. Turning vice into a virtue, this technique has been used to good effect in the long range scanner in Jeff Minter's *Attack of the Mutant Camels*. However, it's hardly noticeable in multicolour mode, as the pixels are twice as wide as in high-resolution mode.

Distorted Hues

The first problem/effect can be used to mix colours together on the screen, producing around 50 distinct hues and another 50 or so textures. You can achieve colour mixing by covering an area of the screen with a close (one pixel apart) striped or chequerboard pattern (that is, by setting alternate pixels on or off). Then, for instance, setting the foreground to red and the background colour to yellow will produce an orange effect. On the Commodore 64, chroma distortion limits us to using horizontal stripes, although this doesn't in itself dictate the number of possible mixes; that's restricted by virtue of the fact that mixing only works if the two colours are taken out of the same grey level set. The sets are shown in Table 1; black is included in the dark grey set, and white in the light grey set.

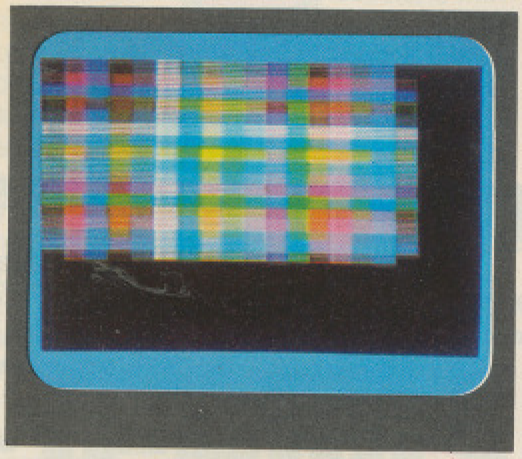
You'll see there are five colours in Sets

```
1 REM "TEXTURES",8
2 DIMF(19)
4 FORI=0TO19:READF(I):NEXTI
6 DATA0,2,6,9,11,1,3,7,13,15,4,5,8,10,12
,14,0,0,0,0
10 POKE 56576,150:POKE53272,8:POKE53265,
59
20 FORI=24*1024TO32*1024-1STEP2
30 POKEI,255:POKEI+1,0
40 NEXT
50 I=16*1024
60 FORY=0TO24
70 FORX=0TO19
80 IFX>16ORY>16THENC=0
90 IFX<17ANDY<17THENC=F(X)*16+F(Y)
100 POKEI,C:POKEI+1,C:I=I+2
110 NEXTX
120 NEXTY
```

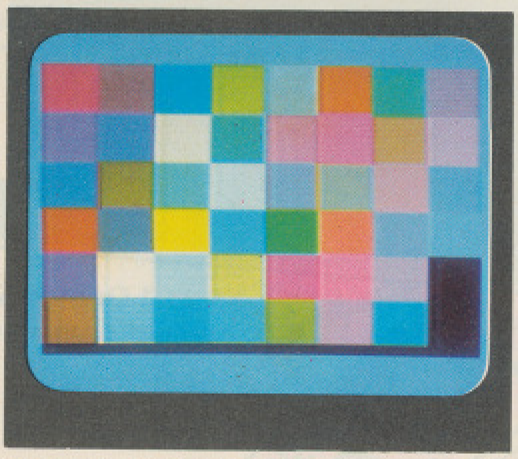
Listing 1: All the colours and textures available on the 64

```
1 REM "TEXTS",8
2 DIMF(19)
4 FORI=0TO19:READF(I):NEXTI
6 DATA0,2,6,9,11,1,3,7,13,15,4,5,8,10,12
,14,0,0,0,0
10 POKE 56576,150:POKE53272,8:POKE53265,
20 DIM G(46,2):K=1:L=0:N=0
21 FORJ=4TO6:L=L+J
22 FORI=KTOL
24 FORM=KTOI
25 N=N+1:G(N,1)=I:G(N,2)=M
26 NEXTM
28 NEXTI:K=K+J
29 NEXTJ
120 FORI=24*1024TO32*1024-1STEP2
130 POKEI,255:POKEI+1,0
140 NEXT
150 I=16*1024:K=0
160 FORX=0TO7:FORY=0TO5:K=K+1
170 FORYY=0TO3:FORXX=0TO4
190 C=F(G(K,1))*16+F(G(K,2))
1100 POKE16*1024+(Y*4+YY)*40+X*5+XX,C
1110 NEXTXX,YY
1120 NEXTY,X
```

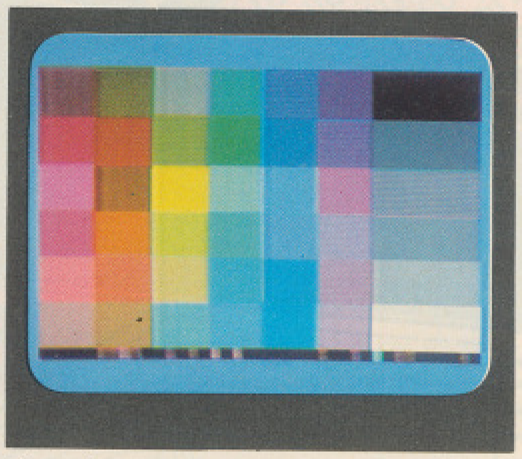
Listing 2: A demonstration of colour mixing in a larger area



All colours and textures available on the 64



The colour mixes plotted on a larger scale



The colours grouped according to the grey scale


New from Alligata
ROCKET ROGER
& THE QUEST FOR THE POWER CRYSTALS
Stranded light years from earth when his space ship runs out of fuel, Rocket Roger has to put fear to one side and set out to explore the dark mystery planet if he's ever to get home. Luckily deep in the heart of this black world Roger can find the vital power crystal that will recharge his stricken spacecraft. Walk, run, jump and even thrust your way round this single, continuously scrolling screen drama as rocket propelled Roger mines his crystal fuel, fighting off hordes of marauding nasties, keeping an eye out for the sizzling security laser beams, sliding doors and invisible force fields. Don't delay too long between crystals if your jet pack runs out of fuel you'll take a freefall from which you'll never return.
RR
Hold on to your seatbelts! The realistic, free fall scrolling action is so good you may get a little dizzy.
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NEW RESOLUTIONS

1 and 3, and six colours in Set 2. This gives us a possible total of (5+4+3+2+1) *3+6=51 mixtures (including the normal colour set) and 16*17/2-51=85 textures (don't worry if you don't follow the second calculation — its not relevant and would take rather a long time to explain). These can be used in conjunction with an area fill routine such as the one given in *Y64* last issue.

Type in Listing 1 and then RUN it. An array of 16 rectangles is plotted on the screen, with alternate rows of pixels set to either foreground or background colour. Each row and column of rectangles has one of the 16 available colours, so that every mixture and texture is displayed on the screen simultaneously. The rows and columns are each split into the three sets of grey level colours, so you can see three large areas where colour mixing works . . . one in the top left, one in the centre, and one at the bottom right. The whole array is symmetrical about the leading diagonal (top left to bottom right).

Listings 2 and 3 show the colour mixes plotted on a larger area so as to be easily visible. In the second of the two, I've made an attempt to order the squares into colours and grey levels.

```
1 REM "TEXTR",8
2 DIMF(19),H(48)
4 FORI=0TO19:READF(I):NEXTI
6 DATA0,2,6,9,11,1,3,7,13,15,4,5,8,10,12
,14,0,0,0,0
10 FORI=1TO48:READH(I):NEXTI
11 DATA 7, 1,32,29,35,39:REM RED
12 DATA 9, 4, 6,31,34,38:REM ORANGE
13 DATA33,30,16,19,23,24:REM YELLOW
14 DATA37,28,15,20,18,22:REM GREEN
15 DATA 8, 3,46,45,42,13:REM BLUE
16 DATA 5, 2,26,41,36,44:REM PURPLE
17 DATA47,10,27,40,25,11:REM GREY
18 DATA47,10,27,40,25,11
19 POKE 56576,150:POKE53272,8:POKE53265,59
20 DIM G(48,2):K=1:L=0:N=0
21 FORJ=4TO6:L=L+J
22 FORI=KTOL
24 FORM=KTOI
25 N=N+1:G(N,1)=I:G(N,2)=M
26 NEXTM
28 NEXTI:K=K+J
29 NEXTJ
120 FORI=24*1024TO32*1024-1STEP2
130 POKEI,255:POKEI+1,0
140 NEXT
150 I=16*1024:K=0
160 FORX=0TO7:FORY=0TO5:K=K+1
170 FORYY=0TO3:FORXX=0TO4
190 C=F(G(H(K),1))*16+F(G(H(K),2))
1100 POKE16*1024+(Y*4+YY)*40+X*5+XX,C
1110 NEXTXX,YY
1120 NEXTY,X
```

Listing 3: Colour mixing with the squares ordered into colours and grey levels

It's interesting, by the way, to re-order the table of suggested character colour combinations, given on page 152 of the 64's *Programmers Reference Manual,* into the three grey level sets shown in table 1. Note that, whereas in Listing 1 all the good mixes occur in the three blocks on the leading diagonal, in this table there are hardly any entries in these three blocks at all.

Fuzzy Stairs

Finally, on a similar theme, a demonstration of 'Anti-aliasing' — a technique used in image processing to disguise the unsightly 'staircasing effect' produced when plotting an object with sloping edges in raster (bit mapped) graphics. Plotting lines in high-resolution graphics produces a 'zigzag' effect on all lines that are not exactly vertical, due of course to the rectangular matrix in which the pixels are arranged. This is most noticeable with lines that are almost, but not quite, vertical or horizontal. The anti-aliasing technique consists of replacing a number of pixels at appropriate places along the slope (actually at the corners of the 'staircase') with pixels of a colour midway between that of the object and the background (for example, light blue for blue and white; orange for red and yellow). The effect is to make the edges look more acceptable, although at the expense of faithfulness to the original. The edges tend to look slightly out of focus rather than stepped, but this is usually more pleasing from an aesthetic point of view; it's a compromise which can be startlingly effective.

The program in Listing 4 (written in Ultrabasic) is intended for use with an extended Basic. If you type in the listing and RUN it you'll see that it plots three pairs of diamonds — red, blue and green — on a white background. The three in the lower half of the screen demonstrate the staircasing effect quite nicely, with some distinctly stepped edges. However, a simple anti-aliasing effect has been used on the top row — a paler border has been drawn and the edges look slightly fuzzy, but straight.

The program can be easily adapted to run with any other graphics package that offers a multicolour option. Numbers 3, 6 and 7 are the three colours red, green and blue. MULTI2,2 sets multicolour mode with a white background, and X and Y are the centre coordinates of the diamonds. DRAWx1,y1,x2,y2,c draws a line from x1,y1 to x2,y2 in colour c; adding eight to a colour gives the paler version . . . pink, light green or pale blue. The FILL routine fills from X,Y to the border. Adding 100 to the colour causes an alternative 'paintbrush' to be used.

Listing 4: A demonstration of anti-aliasing

```
1 DATA 3,6,7
2 MULTI2,2
5 FORI=1TO3:READCA(I)
10 CO=CA(I):X=70*I
20 Y=150:C=CO+8:GOSUB200
40 Y= 50:C=CO:GOSUB200
100 NEXT I:END
200 DRAW X+30,Y,X,Y-30,C
210 DRAW X,Y-30,X-30,Y,C
220 DRAW X-30,Y,X,Y+30,C
230 DRAW X,Y+30,X+30,Y,C
235 FILL X,Y,100+CO,0
240 RETURN
READY.
```

Table 1: grey level colour sets

Light Grey	Medium Grey	Dark Grey
No. colour	No. colour	No. colour
1 White	4 Purple	0 Black
3 Cyan	5 Green	2 Red
7 Yellow	8 Orange	6 Blue
13 L. Green	10 Pink	9 Brown
15 L. Grey	12 Grey	11 D. Grey
	14 L. Blue	



"...and Robbie here is going to teach you all about computers..."

```
100 033C          !RESTOR - POKE THE REQUIRED LINE NUMBER INTO LOCATION
110 033C          !         DATLIN (3F/40 HEX) AND THEN SYS 50000
120 033C          !
130 C350          * = $C350
140 C350          !
150 C350          DATLIN    =  $3F           !CURRENT DATA LINE NO.
160 C350          ADRDAT    =  $41           !ADDR. OF CURRENT DATA
170 C350          LINNUM    =  $14           !LINE SEARCH NUMBER
180 C350          ADRLIN    =  $5F           !ADDR. OF FOUND LINE
190 C350          FNDLIN    =  $A613         !BASIC FIND LINE
200 C350          !
210 C350 A53F     RESTOR    LDA DATLIN       !COPY LINE NUMBER
220 C352 8514               STA LINNUM       !IN DATLIN TO LINNUM
230 C354 A540               LDA DATLIN+1
240 C356 8515               STA LINNUM+1
250 C358 2013A6             JSR FNDLIN       !CALL FIND LINE
260 C35B A55F               LDA ADRLIN       !SUBTRACT 1 FROM
270 C35D E901               SBC £1           !(ADRLIN) AND STORE
280 C35F 8541               STA ADRDAT       !RESULT IN ADRDAT
290 C361 A560               LDA ADRLIN+1
300 C363 E900               SBC £0           !SUBTRACT CARRY
310 C365 8542               STA ADRDAT+1
320 C367 60                 RTS              !RETURN TO BASIC
330 C368
```

Listing 1: Simulating a numbered RESTORE statement in 6510 assembler

```
10 FOR C=0 TO 23
20 READ BYTE
30 POKE 50000+C,BYTE
40 NEXT C
50 DATA 165,63,133,20
60 DATA 165,64,133,21
70 DATA 32,19,166,165
80 DATA 95,233,1,133
90 DATA 65,165,96,233
100 DATA 0,133,66,96
```

Listing 2: the machine code loader

```
5000 LH=INT(L/256)
5010 LL=L-256*LH
5020 POKE 64,LH
5030 POKE 63,LL
5040 SYS 50000
5050 RETURN
```

Listing 3: the RESTORE subroutine

Restorative

One of the biggest headaches in using DATA statements on the 64, says Phil Cornes, is the lack of a numbered RESTORE statement (allowing to RESTORE to a specified line number). This feature is available in many Basics as RESTORE ‹line no.›.

Simulating a numbered RESTORE statement is, fortunately, a fairly simple matter using a straightforward machine code routine (see Listing 1). Listing 2 is the same thing in the form of a Basic machine code loader; to use it as part of your own Basic programs, you'll need to include both this and Listing 3. Listing 2 must be RUN early in your program (preferably the first code to be executed) and then:

L=‹line no.›:GOSUB 5000

is the equivalent of RESTORE ‹line no.›.

Alarm Clock

If you've ever got so engrossed in your 64 that you've forgotten to go to bed, head off to work or feed the cat, *Alarm Clock* from Andrew Bennett should do the trick.

Alarm clock is an interrupt-driven routine. It prompts you to enter the current time and the time you want the alarm to signal. You can then use the machine normally; when the alarm time is reached, the screen flashes for five seconds. The program will run independently of almost all Basic programs, most business software and any machine-code games which don't use interrupts. Since the alarm is silent, it can be used to signal bedtime without waking everyone else who went to bed at a reasonable hour!

```
100 REM ** COMMODORE 64 ALARM CLOCK **
110 REM
120 REM **   BY ANDREW R. BENNETT   **
190 REM
200 PRINT"▮":POKE53280,6:POKE53281,6:REM
 SCREEN&BORDER = BLUE
```

Lines 200 Set screen colours.

```
210 TI$ = "000000" :REM ZERO TIME$
```

Lines 210 Zero TIME string.

```
220 PRINT"▮▮▮▮▮▮▮▮▮▮COMMODORE 64 ALARM C
LOCK"
230 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮BY ANDREW R.BENNE
TT 1984"
240 PRINT"▮▮▮▮▮▮▮▮PLEASE ENTER THE PRESE
NT TIME"
250 PRINT"▮▮▮▮▮▮▮▮▮▮IN 24 HOUR CLOCK STYL
E
252 PRINT"▮▮▮▮▮▮REMEMBER▮  12 MIDNIGHT I
S 00 HOURS."
260 PRINT"▮▮ HOURS : ";:INPUT HOUR$
270 PRINT"▮ MINUTES : ";:INPUT MINS$
```

Lines 220-270 Screen 1, Enter present time.

```
280 HOUR = VAL(HOUR$):IF HOUR<0 OR HOUR>
23 OR HOUR<>INT(HOUR)THENGOSUB10000:RUN
290 MINS = VAL(MINS$):IF MINS<0 OR MINS>
59 OR MINS<>INT(MINS)THENGOSUB10000:RUN
```

Lines 280-290 Check that time exists.

```
300 PRINT"▮▮▮▮IS THE PRESENT TIME "HOUR"
:"MINS$" (Y/N)?"
310 GOSUB11000
320 IFAN$="N"THENRUN
330 IFAN$<>"Y"THEN310
```

Lines 300-330 Verify present time with user.

```
340 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮NOW ENTER THE ALARM
 TIME"
342 PRINT"▮▮▮▮▮▮▮▮▮▮IN 24 HOUR CLOCK STYL
E
345 PRINT"▮▮▮▮▮▮REMEMBER▮  12 MIDNIGHT I
S 00 HOURS."
350 PRINT"▮▮HOURS : ";:INPUT A1$
360 PRINT"▮MINUTES : ";:INPUT A2$
```

Lines 340-360 Screen 2, Enter Alarm time.

```
370 A1 = VAL(A1$):IF A1<0 OR A1>23 OR A1
<>INT(A1)THENGOSUB10000:GOTO340
380 A2 = VAL(A2$):IF A2<0 OR A2>59 OR A2
<>INT(A2)THENGOSUB10000:GOTO340
```

Lines 370-380 Check that Alarm time with user

```
390 PRINT"▮▮▮▮IS THE ALARM TIME "A1":"A2
$" (Y/N)?"
400 GOSUB11000
410 IFAN$="N"THEN340
420 IFAN$<>"Y"THEN400
```

Lines 390-420 Verify Alarm time exists.

```
430 A3 = A1+1
```

Lines 430 Set A3 to become Alarm Hour +1.

```
500 IF(A1<HOUR)THEN510
505 GOTO530
510 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮I AM ASSUMING THA
T ALARM TIME IS "
520 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮TOMORROW MORNING!!
```

```
!"
525 FORI=0TO2000:NEXT
```

Lines 500-505 If Alarm time is less than Present time then Print message.

```
530 H1=0:IFHOUR>12THENHOUR=HOUR-12:H1=1
535 B1=0:IFA1>12THENA1=A1-12:B1=1:A3=A3-
12
```

Lines 530-535 Special checks for Noon.

```
560 REM * CONVERT ALL TO BCD FORMAT *
570 Q=A1:GOSUB20000:A1=Q
580 Q=A2:GOSUB20000:A2=Q
585 Q=A3:GOSUB20000:A3=Q
590 Q=HOUR:GOSUB20000:HOUR=Q
600 Q=MINS:GOSUB20000:MINS=Q
```

Lines 560-600 Convert all Hours and Minutes into BCD format.

```
610 REM * WORK OUT IF A.M. OR P.M. *
620 IF (H1=0)THEN640
630 HOUR=(HOUR OR 128):REM SET BIT 7
640 IF (B1=0)THEN662
650 A1=(A1 OR 128):REM SET BIT 7
655 A3=(A3 OR 128):REM SET BIT 7
```

Lines 610-655 Set 7th Bits if in the Afternoon.

```
660 REM * CHECK FOR SPECIAL CASES *
662 IFA1=0THENA1=18:A3=1:GOTO667
663 IFA1=18THENA1=146
664 IFA1=146THENA3=129
665 IFA1=17THENA3=146
666 IFA1=145THENA3=18
667 IFHOUR=146THENHOUR=18:GOTO672
668 IFHOUR=0THENHOUR=146
```

Lines 660-668 Check for special cases.

```
671 REM * STORE $C000,$C001 AND $C003
 *
672 POKE12*16↑3,A1
675 POKE12*16↑3+1,A2:POKE12*16↑3+3,A3
```

Lines 671-675 Poke Alarm time into memory.

```
679 REM * READ IN M/C *
680 PRINT"■PLEASE WAIT.....":C=12*16↑3+4
685 FORI=0TO90:READA:POKEC+I,A:T=T+A:NEX
TI
686 IFT<>11490THENPRINT"■■■THERE IS AN
ERROR IN THE DATA STATEMENTS":STOP
```

Lines 679-686 Read and Poke in the machine code interrupt routine.

```
689 REM * STORE TIME *
692 POKE56331,HOUR
695 POKE56330,MIN:POKE56329,0:POKE56328,
0
```

Lines 689-695 Poke the time into one of the '64s built in timers.

```
710 POKE56334,PEEK(56334)OR128
```

Lines 710 Trick '64 into thinking it is American for timing purposes.

```
715 REM * START INTERUPT *
720 POKE12*16↑3+2,0:REM ZERO $C002
725 SYS12*16↑3+4
```

Lines 715-725 Start the Interrupt routine.

```
735 POKE53280,254:POKE53281,246:REM REVE
RT TO NORMAL COLOURS
```

Lines 735 Revert to normal colours.

```
740 PRINT"■■■YOU MAY NOW USE YOUR '64 AS
 NORMAL, BUT"
750 PRINT"■■■DON'T PRESS RUN/STOP-RESTOR
E OR THE "
755 PRINT"■■■■■■■■■ALARM WILL NOT FUNCTI
ON."
760 END :REM * END OF PROGRAM *
```

Lines 740-760 Print final message and end.

```
9999 REM * CORRECT INCORRECT INPUT *
10000 PRINT"■■■YOUR INPUT IS ■INCORRECT■
, TRY AGAIN!!!!":FORT=0TO2000:NEXTT
10010 RETURN
```

Lines 9999-10010 Subroutine for incorrect input.

```
10999 REM * WAIT FOR KEY PRESS *
11000 GETAN$:IFAN$=""THEN11000
11010 RETURN
```

Lines 10999-11010 Wait for keypress.

```
19999 REM * CONVERT TO BCD FORMAT *
20000 TENS=INT(Q/10):UNITS=Q-10*TENS
20005 Q=16*TENS+UNITS :REM BCD FORMAT FO
R CLOCK
20010 RETURN
```

Lines 19999-20010 Subroutine for BCD conversion.

```
24999 REM * DATA FOR M/C *
25000 DATA120,169,17,141,20,3,169
25010 DATA192,141,21,3,88,96,173
25020 DATA2,192,208,59,173,11,220
25030 DATA205,3,192,240,16,173,11
25040 DATA220,205,0,192,208,43,173
25050 DATA10,220,205,1,192,144,35
25060 DATA162,15,142,87,192,206,87
25070 DATA192,174,87,192,240,19,162
25080 DATA240,238,32,208,238,33,208
25090 DATA160,255,136,208,253,202,208
25100 DATA242,76,51,192,238,2,192
25110 DATA173,8,220,76,49,234,0
25120 DATA0,0,0,0,0,255,0,0,0
```

Lines 24999-25120 Data for Machine code.

```
40000 REM
40010 REM             ** PROGRAM NOTES *
*
40011 REM
40012 REM         DO NOT TYPE IN THE FOLL
OWING
40020 REM
40030 THIS PROGRAM WILL WORK WITH ALL PR
OGRAMS THAT DON'T USE INTERUPTS
40040 I.E. SOME GAMES, AND WILL PROBABLY
 WORK WITH MOST BUSINESS SOFTWARE.
40050 I SUGGEST THAT YOU TRY A SHORT ALA
RM E OF SAY 5 MINUTES TO TEST
40060 COMPATABILITY WITH YOUR FAVOURITE
PROGRAMS.
40070 THE ALARM WILL NOT FUNCTION IF THE
 RUN/STOP RESTORE COMBINATION IS
40080 USED - IF YOU FEEL THAT YOU WILL N
OT NEED TO USE THESE KEYS THEN YOU
40090 CAN DISABLE RUN/STOP RESTORE WITH
'POKE 808,234' (RETURN).
40120 THE MACHINE CODE ROUTINE ITSELF IS
 POKED INTO $C004 BUT, WITH A
40130 LITTLE WORK AND AN ASSEMBLER COULD
 BE ALTERED FOR ANY AREA OF MEMORY.
40140 IF YOU SHOULD PRESS RUN/STOP RESTO
RE THEN SIMPLY TYPE
40150 'SYS 49156 (RETURN)' TO RESTORE TH
E ALARM PROGRAM INTO THE INTERUPT.
```

Lines 40000-40150 Program notes.

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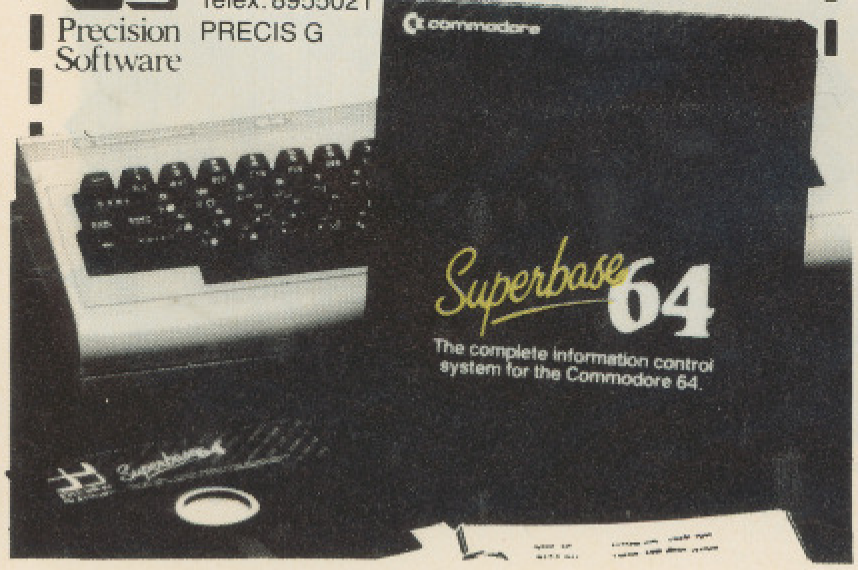
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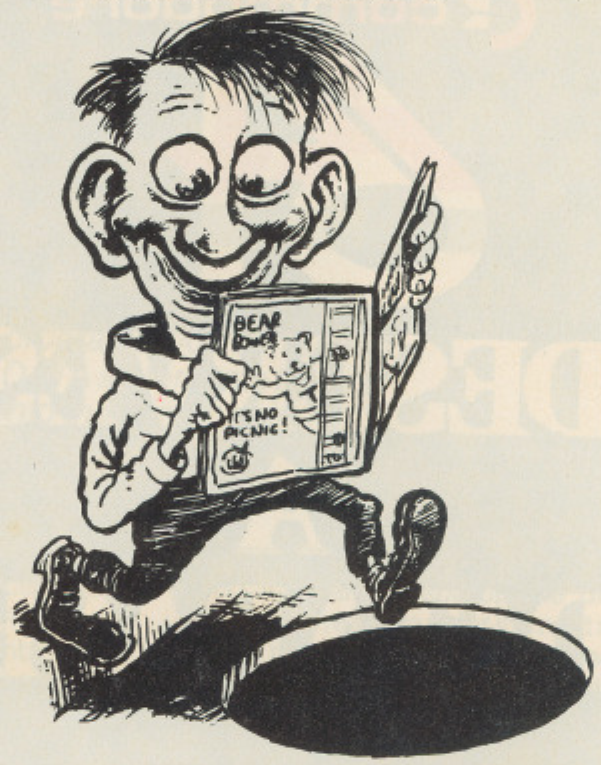
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KEYBOARD KAPERS

JOYSTICK JAM

Music assembler/editor is an easy to use and sophisticated synthesiser program. Unlike many music programs, you don't need to either read music or enter long lines of DATA statements to enter a tune. You simply copy sheet music onto the screen using a joystick, and the program does the rest!

By Rob Christer

Have you ever looked at the very long list of capabilities of the 64s SID (Sound Interface Device) chip and wondered: where do I start? The SID chip takes care of all sound effects and music that you might produce on the 64 and has features normally found only on synthesisers costing hundreds of pounds.

This program makes it easy, in fact simple, to enter sheet music into the 64 and then play it back using one, two or all three SID chip voices. There is even the capability to play back music in your own programs or to have music playing in the background as you write your programs! To use the program, you don't need any knowledge of music, sheet music or even the SID chip itself. You simply have to copy the sheet music into the program note by note, using a joystick. You can buy sheet music at any good music shop and there is usually a large selection available ranging from Mozart to Boy George. For the best results with Music Assembler, stick to piano music.

Entering music

When you've typed in the program, SAVE it before you RUN it. When RUN, the program will present you with the first of the two instruction screens. After reading both, you will be asked to enter 3/4 or 4/4 time. This is usually given at the beginning of the sheet music. The program then presents you with several options, which can be selected using the function keys. Press F7, which gets you to the heart of the program, the Music Assembler itself. You will be presented with three blank bars of sheet music and a piano keyboard.

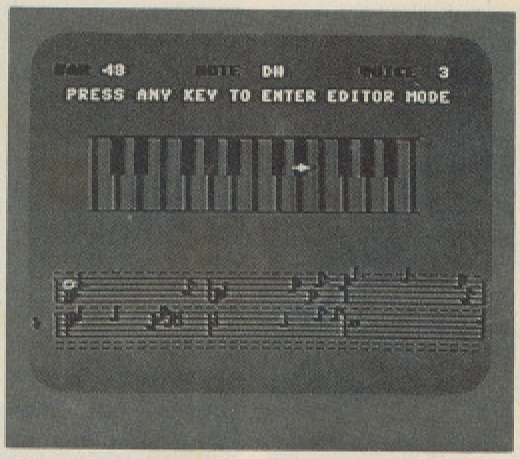
On the keyboard, a diamond-shaped sprite is moved to the appropriate key by moving the joystick up or down. As the sprite moves along the keyboard, another note-shaped sprite, on the musical bar, moves to the appropriate position on the stave. A readout at the top of the screen tells you which key you're selecting. Moving the joystick left or right selects the duration or 'shape' of the note. Therefore it is possible to copy sheet music without really knowing what you are doing — you merely have to copy the shape and position of each note. When you select a sharp note on the keyboard the sprite on the bar turns yellow. You should note that flat notes are displayed as the sharp of the note below. For example a B flat will be displayed as an A sharp. When you have the required note and duration, press the joystick button and the note will be drawn onto the bar. Rest notes can be selected by moving the joystick left or right until the note-shaped sprite becomes an 'R'. If you press the joystick button, rest mode will be entered for one note only. Select the type of rest note required and press the button again. The note-shaped sprite moves along the bar the appropriate distance and you are ready to enter the next note by exactly the same method. This procedure is followed for each note until the first three bars for voice one are entered. The first three bars may then be entered for voice two and then voice three, for which a new set of bars is drawn. In this way you copy the complete tune into Music Assembler.

When you've finished entering music, press any key and you'll be returned to the program's main menu. If you press F3, the program will play it back.

Now that you've entered the music, press F8 to save to tape or disk. After choosing between tape and disk, type in a suitable file name and your music will be saved. Loading your music back into the program is simply a matter of choosing the load option and following the menus.



All the options are chosen by pressing the appropriate function key



Both the note and duration are selected using a joystick

The editor menu

The following options are available within Music Assembler to help you manipulate your music:

F1 Change or copy bars.
F2 Change tempo or octave.
F3 Play music.
F4 Define envelopes.
F5 Define waveforms.
F6 Define filters.
F7 Music assembler.
F8 Load or save music.

We've already discussed the F3, F7 and F8 options. Let's now look at the others. Each choice is entirely menu driven and therefore needs little explanation.

F1: Upon pressing F1 you are presented with a choice of changing or copying a bar. If your music has bars that are repeated, you can use the 'Copy Bar' option to copy bars from one part of the music to another. 'Change Bar' lets you go back to any particular bar and edit any mistakes, by changing the bar number to the bar to be corrected.

F2: Pressing F3 gives you the option of changing the music's tempo or the octaves that the music will be played in.

F4: Lets you change the music's attack, decay, sustain and release envelope

These parameters change the way in which the music is played by the SID chip.
F5: Gives you the option of changing the waveform for each voice from a choice of triangle, sawtooth, pulse, and noise. This option also lets you choose some of the more advanced facilities of the SID chip, ring modulation, synchronisation of two or three voices, adding triangle waveform to pulse waveform and voice three on or off. These facilities are fully explained on pages 191-208 of the 64 Programmer's Reference Guide.
F6: By pressing F6, you're given the option of changing the SID's filters for each voice. These affect how much of each note of your music is played. Like the options given when you choose F5, the values given to these by the program are sufficient for most tunes and they should only be changed for advanced purposes.

The interrupt-driven routine

Invisibly, every 60th of a second, the 64 jumps to a machine code program that updates the TI$ clock and checks the keyboard for input. This program is called the interrupt routine and it is possible to tack another machine code program on to the beginning of it. This machine code program will also be executed 60 times a second, whatever else is happening to the 64. The 'Music IRQ' program given here (in the form of a Basic loader) uses this method to play the music that you have written using Music Assembler.

You can use this Basic loader in your own programs, as long as they start with the line:
POKE 55,240: POKE 56, 79 so that your music file doesn't load over your program. To load the music file fromm within your program include the following line at the start of your program:

5 A=A+1: IF A=1 THEN LOAD "NAME OF TUNE",8,1

When you RUN your program the music file will be LOADed first. The music is started with SYS49152 and stopped by SYS49382. You can also change the tempo of the music by POKEing location 254 with a value between 0 and 255. 0 being very fast and 7 being its normal value.

THE INTERRUPT-DRIVEN ROUTINE

```
10 I=49152
20 READ V:IFV=-1THEN45
30 POKEI,V
40 I=I+1:GOTO20
45 END
50 DATA173,252,79,141,2,212,173
60 DATA251,73,141,3,212,173,250
70 DATA79,141,9,212,173,249,79
80 DATA141,10,212,173,248,79,141
90 DATA16,212,173,247,79,141,17
100 DATA212,173,246,79,141,5,212
110 DATA173,245,79,141,6,212,173
120 DATA244,79,141,12,212,173,243
130 DATA79,141,13,212,173,242,79
140 DATA141,19,212,173,241,79,141
150 DATA20,212,169,15,141,24,212
160 DATA169,0,133,251,169,80,133
170 DATA252,169,5,133,253,133,254
180 DATA120,173,21,3,141,229,192
190 DATA173,20,3,141,228,192,169
200 DATA192,141,21,3,169,116,141
210 DATA20,3,88,96,72,138,72
220 DATA152,72,198,253,208,97,165
230 DATA254,133,253,160,2,177,251
240 DATA201,255,208,8,169,0,133
250 DATA251,169,80,133,252,160,0
260 DATA177,251,141,0,212,200,177
270 DATA251,141,1,212,200,177,251
280 DATA41,251,141,4,212,200,177
290 DATA251,141,7,212,200,177,251
300 DATA141,8,212,200,177,251,41
310 DATA251,141,11,212,200,177,251
320 DATA141,14,212,200,177,251,141
330 DATA15,212,200,177,251,41,251
340 DATA141,18,212,165,251,24,105
350 DATA9,133,251,144,7,165,252
360 DATA24,105,1,133,252,104,168
370 DATA104,170,104,76,49,234,120
380 DATA169,234,141,21,3,169,49
390 DATA141,20,3,169,0,141,24
400 DATA212,88,96,-1
READY.
```

THE MAIN LISTING

```
1000 CLR:POKE55,240:POKE56,79:DIMN$(60),
NV(60),NP(60),Y4(24),X4(24),M2(64)
```

Line 1000 Dimensions the arrays, drops the top of memory.

```
1010 BL$="
          "
```

Line 1010 String used to clear the text from the screen.

```
1020 POKE53281,12:POKE53280,12:PRINT"▟"
```

Line 1020 Change the screen and border colours.

```
1030 POKE53269,0:GOSUB 5300:GOSUB4500:PO
KE53291,7:GOTO2420
```

Line 1030 Disable sprites.

```
1040 REM MAIN
1060 SYS32797:PRINT"▟██   ▜PRESS ANY KEY
 TO ENTER EDITOR MODE███"
```

Line 1060 Call split screen routine.

```
1070 PRINT"      ____________________________
______"
1080 FORI=1TO3:PRINT"      █| ▜ ▀ ▜ ▀ | ▜
▀ ▜ ▀ ▜ ▀ | ▜ ▀ ▜ ▀ | ▜ ▀ ▜ ▀ ";
1090 PRINT"▜ ▀ |  ":NEXT
1100 FORI=1TO3:PRINT"      █| | | | | | |
 ";
1110 PRINT"| | | | | | | |  ":NEXT
1120 PRINT"      ____________________________
______"
```

Lines 1070-1120 Draw piano keyboard on screen.

```
1130 POKE198,0:POKE2044,13:POKE50171,35
1140 POKE53248,100:POKE53248,100
1150 POKE53269,255:POKE53254,Q:POKE53255
,NP(N1)
1160 POKE53256,X4(P4-N1):POKE53257,Y4(P4
```

WHERE IS 1190? TOOK OUT FROM:

REM? 2500?

```
-N1)
1170 REMIFB6>9THENB7=49:GOTO1190
1210 IF B6=0THENB6=B5
```

Lines 1130-1210 Enable and display sprites.

```
1220 PRINT"■   BAR      ■■■■■";HO
1230 PRINT"■■■■■■■■■■■■■■■■■■■NOTE   ■";N$(N
1);"  "
1240 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■
■■VOICE  ■";V
```

Lines 1220-1240 Write text to screen.

```
1250 GETZ$:IFZ$<>""THEN2420
1260 JO=PEEK(56320):JO=15-(JOAND15)
1270 IFJO=1THENN1=N1-1
1280 IFJO=2THENN1=N1+1
1290 IFJO=8THENBL=BL+1
1300 IFJO=4THENBL=BL-1
1310 IFPEEK(56320)=111THENGOSUB1500
1320 IFBL=44THENBL=35
1330 IFBL=34THENBL=43
1340 IFNP>131THENNP=76
1350 IFNP<76THENNP=131
1360 IFN1<1THENN1=48
1370 IFN1>48THENN1=1
1380 IFN1>24THENP4=49:GOTO1400
```

Lines 1250-1380 Read joystick and keyboard.

```
1390 P4=25
1400 Q2=Q:IFQ>255THENPOKE53264,PEEK(5326
4)OR8:Q2=Q2-255
1410 IFQ<256THENPOKE53264,PEEK(53264)AND
247
1420 POKE50171,BL:POKE53254,Q2:POKE53255
,NP(N1)
1430 X3=X4(P4-N1):IFX4(P4-N1)>255THENPOK
E53264,PEEK(53264)OR16:X3=X3-255
1440 IFX4(P4-N1)<256THENPOKE53264,PEEK(5
3264)AND239
1450 POKE53256,X3:POKE53257,Y4(P4-N1)
1460 IFLEN(N$(N1))=2ANDRE=0THENC2=7:C1=7
1470 IFLEN(N$(N1))=1ANDRE=0THENC1=1:C2=1
1480 POKE53290,C1:POKE53254,Q2:POKE53255
,NP(N1)
1490 GOTO1170
```

Lines 1400-1490 Position sprites on screen, check if MSB of sprite x direction needs setting.

```
1500 REM DRAW
1520 IFBL=43THENC1=1:BL=35:RE=4:RETURN
1530 IFRE=4THENC1=11:GOSUB1730
1540 IFRE=0THENGOSUB1800
1550 IF ER=1THENER=0:RETURN
1560 POKE53254,Q2:POKE53255,NP(N1)
1565 IFRE=0THENGOSUB7000
1570 Q=Q+D(BL-34)*BB:RE=0
1590 IFB6>9THENB7=49:GOTO1610
1600 B7=48
1610 IFINT(Q)=138 ORINT(Q)=238THEN B6=B5
:HO=HO+1
1620 IF Q>335THENB6=B5:GOSUB1640
1630 RETURN
```

Lines 1500-1630 Called when fire button is pressed. Check to see if the entry is a note or a rest and calls the routines. Calculate how far the sprite on the sheet has to move.

```
1640 REM  NVOICE
1650 V=V+1:Q=38:N1=24:P4=N1+1:IFV=4THENV
=1
1660 IFV=1THENEP=LP:LP=PP:GOSUB2260
1670 IFV7<>VANDV<>1THENHO=HO-2
1680 PP=LP:V7=V:IFPL=1THENPP=EP:LP=PP
1690 IFPL=2THENPL=1:GOSUB2030
1700 IFPL=1THENGOSUB2220
1710 IFPL=1THENPL=0:PRINT"■■■■■■■PRESS A
NY KEY TO ENTER EDITOR MODE":Z1=0
1720 RETURN
```

PL=? ZERO

Lines 1640-1720 Move the sprite on the sheet to the start of the bars for the next voice. Update the voice number.

```
1730 REM  REST
1750 B6=B6-D(BL-34):IF B6<0THENGOSUB1960
1760 IF ER=1THEN B6=B6+D(BL-34):RETURN
1770 FORI=1TOD(BL-34)
1780 POKEPP+V*V5,TL%:POKEPP+V*V5+V2,TH%:
POKEPP+V*V5+V3,VV(V)-1
1790 PP=PP+9:NEXT:RETURN
```

Lines 1730-1790 Enter a rest into the music file.

```
1800 REM  NOTE
1820 B6=B6-D(BL-34)
1830 IF B6<0THENGOSUB1960
1835 IF ER=1THEN B6=B6+D(BL-34):RETURN
1850 FR=NV(N1):FR=FR/FK(V)
1860 TH%=FR/256:TL%=FR-256*TH%
1870 IFD(BL-34)=1THENPOKEPP+V*V5,TL%:POK
EPP+V*V5+V2,TH%
1880 IFD(BL-34)=1THENPOKEPP+V*V5+V3,VV(V
):PP=PP+9:RETURN
1890 FORI=1TOD(BL-34)-1
1900 POKEPP+V*V5,TL%:POKEPP+V*V5+V2,TH%
1910 POKEPP+V*V5+V3,VV(V):PP=PP+9
1920 NEXT
1930 POKEPP+V*V5,TL%:POKEPP+V*V5+V2,TH%
1940 POKEPP+V*V5+V3,VV(V)-1:PP=PP+9
1950 RETURN
```

Lines 1800-1950 Enter a note into the music file.


```
1960 REM ERROR
1970 PRINT"■■■";BL$
1980 PRINT"■■■ NOTE OR REST DURATION TOO
 LONG REDO"
1990 FOR D=1TO3000:NEXT:ER=1
2000 PRINT"■■■";BL$
2010 PRINT"■■■■■■PRESS ANY KEY TO ENTER
EDITOR MODE"
2020 RETURN
```

TIMER 1000?

Lines 1960-2020 Check to see if the note or rest just entered is too long; if so the error message is displayed.

```
2030 REM  PLA
2040 SID=54272
2050 POKE54277,AD(1):POKE54278,SR(1)
2060 POKE54284,AD(2):POKE54285,SR(2)
2070 POKE54291,AD(3):POKE54292,SR(3)
2080 POKESID+10,HP(2):POKESID+3,HP(1)
2090 POKESID+17,HP(3):POKESID+16,LP(3)
2100 POKESID+9,LP(2):POKESID+2,LP(1)
2110 POKESID+24,15ORFS
```

15 OR FS 15ORFS?

Lines 2030-2110 POKE values for ADSR pulse widths and filters, and SID registers.

```
2120 POKESID+4,0:POKESID+11,0:POKESID+18
,0
2130 FORI=MWTOPP-9STEP9
2140 POKESID,PEEK(I):POKESID+1,PEEK(I+1)
```

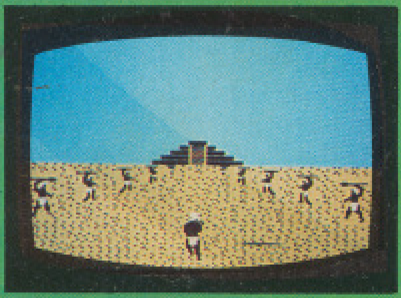
DON'T JUST SIT THERE - PLAY SOMETHING!

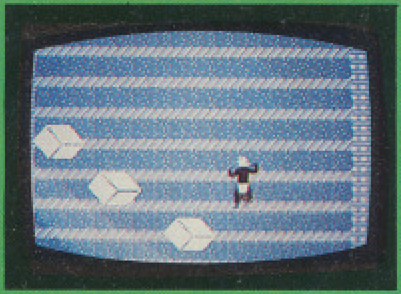
FORBIDDEN FOREST

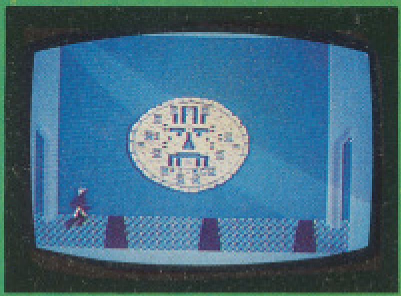
Forbidden Forest is more of a quest than just a game! The action takes place in a four dimensional scrolling forest landscape which many have entered, but none has returned. Yes, I did say FOUR dimensional - day fades into night as the action unfolds! The quest is to seek out and destroy the Demogorgon, mystic ruler of the Forbidden Forest. Before you can even set eyes on him you will have to contend with his army of fearsome creatures, including mutant spiders, showers of giant frogs, snakes, dragons, skeleton soldiers and more! You have only your trusty bow and arrows to depend on!



SS018







AZTEC CHALLENGE

A challenge on an epic scale! Aztec Challenge takes you on a journey to Mexico and the ancient pyramid of Tenochtitlan. The ancient Aztec gods and their devotees have ensured that no ordinary human can learn the secrets of the temple and live to tell the tale. The pyramid is protected by all manner of treacherous traps and hidden perils - an epic test of your courage and cunning. Aztec Challenge features no less than seven totally different screens - here are just three of them - each of which presents a brand new challenge. We hope your joystick can stand up to it!

SS019

SLINKY

Slinky, the spring, was having fun hopping about when suddenly he came upon a pile of coloured blocks, so he thought he'd play around on them for a while. Much to his amazement he found that they changed colour when he landed on them. Wow! But unknown to him, the blocks belonged to the Wicked Wizard, who sent his friends along to tease our poor hero. Slinky is a real fun package with ninety-nine levels, amazing reward displays, and action replays. Where else could you meet such charming characters as Dusty the dust cloud, Marge the magnet, Ralph the random raindrop, and Lorenzo the chameleon hopper?



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KAPERS

```
2150 POKESID+7,PEEK(I+3):POKESID+8,PEEK(
I+4)
2160 POKESID+14,PEEK(I+6):POKESID+15,PEE
K(I+7)
2170 POKESID+4,PEEK(I+2)AND247:POKESID+1
1,PEEK(I+5)AND247
2180 POKESID+18,PEEK(I+8)AND247
2190 FORD=1TODL:NEXT:NEXT
2200 POKESID+24,0:POKESID+4,0:POKESID+11
,0:POKESID+18,0
2210 RETURN
```

Lines 2120-2210 Get values for frequency and waves and POKE them into the SID chip.

```
2220 REM  CLR
2230 SYS32768
2240 GOSUB5190
2250 RETURN
```

Lines 2220-2250 Call hires screen-clear routine and redraw music sheet.

```
2260 REM  CON
2270 PL=0:IFZ1=1THENPL=1:GOTO2320
2280 PRINT"";BL$
2290 PRINT"CONTINUE OR R
EDO"
2300 PRINT"JOY UP CONTINUE JOY DOW
N REDO"
2320 JO=PEEK(56320):JO=15-(JOAND15)
2330 IF JO=2THEN PL=1:HO=HO-2
2340 IF JO=1THENPL=2:HO=HO+1
2350 IFPL=0THEN2320
2360 PRINT"";BL$:PRINTBL$
2380 RETURN
```

Lines 2260-2380 Give option to continue to next three bars or to redo the last three bars.

```
2420 REM  EDITOR
2440 POKE53269,0:PRINT"
EDITOR MENU":POKE198,0
2445 SYS32927:REM  ****RESTORE VECTOR
2450 PRINT"[F1] CHANGE BARS  [F2]
 TEMPO OR OCTAVE"
2460 PRINT"[F3] PLAY MUSIC   [F4]
 ENVELOPES"
2470 PRINT"[F5] WAVEFORMS    [F6]
 FILTERS"
2480 PRINT"[F7] ASSEMBLER    [F8]
 LOAD OR SAVE"
2490 PRINT"SELECT OPTION"
```

Lines 2420-2490 Display editor menu.

```
2500 GETZ$:IFZ$=""THEN2500
2510 IP=ASC(Z$)-132
2520 IFIP<1ORIP>8THEN2500
2530 ONIPGOTO4050,2550,2570,1060,3810,31
60,3280,3710
2540 GOTO 2420
2550 GOSUB2030:GOTO2420
```

Lines 2500-2550 Get user input and calls relevant routine.

```
2560 REM  REDEFINE
2570 GOSUB2700:POKE198,0
2580 PRINT"CHANGE FROM BAR
"
2590 Z=1:TP=80:BO=1:GOSUB9000:CB=Z
2610 PRINT"":FORD=1TO3:FORI=(MW-1+CB*V9
)+D*3TOPP-9STEP9
2620 PRINT"REDEFINING VOI
```

```
CE";D
2630 IF D=3ANDPEEK(I)=129ORPEEK(I)=128TH
ENGOTO2650
2640 IF PEEK(I)AND1THEN POKEI,VV(D):GOTO
2650
2645 POKEI,VV(D)-1
2650 NEXT:NEXT
```

Lines 2560-2650 Change values for waves in music file after redefining routine has been used.

```
2660 PRINT"■■■■■■■■■■■■[F1]=VOICE THREE
OFF"
2665 PRINT"■■■■■■■■■■■[F3]=VOICE THREE ON
"
2670 GETZ$:IFZ$=""THEN2670
2675 Z=ASC(Z$):IFZ=133ORZ=134THEN2680
2676 GOTO2670
2680 IF Z=1THENFS=FSOR128:GOTO2690
2685 FS=FSAND(127)
2690 GOTO 2420          = EDITOR
```

Lines 2660-2690 Offer the choice to switch off voice three.

```
2700 REM  SELFDEFINED
2720 :FORI=1TO3
2730 PRINT"■■■■■■■■■■■■■WAVEFORM FOR VOICE
";I
2740 PRINT"■■■■■[F1] TRIANGLE  [F3] SAWT
OOTH"
2750 PRINT"■■■■■[F5] PULSE     [F7] NOIS
E"
2760 PRINT"■■■■■[F8]■ CONTINUE TO NEXT
VOICE"
```

Lines 2700-2760 Display menu for redefine routine.

```
2770 Z=0:GETZ$:IFZ$=""THEN2770
2780 Z=ASC(Z$):IFZ=133ORZ=134ORZ=135ORZ=
140ORZ=136THEN2800
2790 GOTO2770
2800 FORD=1TO300:NEXT
2810 IF Z=140THENGOTO3130
2820 IFZ<>133THEN2900
2830 VV(I)=17
```

Lines 2770-2830 Get user input for above.

```
2840 PRINT"■■■■■■■■■■RING MODULATE VOICE
";I:
2850 PRINT"■■■■■■■■■■■[F1]=YES    [F3]=NO"
2860 GETZ$:IFZ$=""THEN2860
2870 A=ASC(Z$):IFA=133ORA=134THENGOTO289
0
2880 GOTO2860
2890 IFA=133THENVV(I)=VV(I)OR2
2900 IFZ=134THENVV(I)=33
2910 IFZ=136THENVV(I)=129
2920 IFZ<>135THEN3070
2930 VV(I)=65:POKE198,0
```

Lines 2840-2930 Offer ring modulation of voices.

```
2940 PRINT"■■■■■■■■■■■■■HIGH  PULSE FOR VO
ICE";I
2950 TP=15:BO=0:Z=HP(I):GOSUB9000:HP(I)=
Z
2970 PRINT"■■■■■■■■■■■LOW PULSE FOR VOICE
";I
2980 TP=255:BO=0:Z=LP(I):GOSUB9000:LP(I)
=Z
```

Lines 2940-2980 Prompt for pulse widths.

```
3000 PRINT"■■■■■ADD TRIANGLE WAVEFORM TO
 PULSE"
3010 PRINT"■■■■■■■■■■[F1]=YES    [F3]=NO"
3020 GETZ$:IFZ$=""THEN3020
3030 Z=ASC(Z$)
3040 IFZ=133ORZ=134THEN3060
3050 GOTO3020
3060 IFZ=133THENVV(I)=VV(I)OR16
```

Lines 3000-3060 Offer option of adding a triangle waveform to the pulse waveform.

```
3070 PRINT"■■■■■■■■■■SYNCHRONIZE VOICE "
;I
3080 PRINT"■■■■■■■■■■■[F1]=YES    [F3]=NO"
3090 GETZ$:IFZ$=""THEN3090
3100 Z=ASC(Z$):IFZ=133ORZ=134THEN3120
3110 GOTO3090
3120 IFZ=1THENVV(I)=VV(I)OR4
3130 PRINT"■":NEXT:POKE198,0:RETURN
```

Lines 3070-3130 Offer synchronised voices.

```
3140 :
3160 POKE198,0:FORI=1TO3
3170 PRINT"■■■■■■■■■■■■■DEFINE ENVELOPES"
3180 PRINT"■■■■■■■■■■■■ATTACK RATE FOR VO
ICE";I
3185 Z=(AD(I)AND240)/16:TP=15:BO=0:GOSUB
9000:A=Z
3200 PRINT"■■■■■■■■■■■DECAY RATE  FOR VOI
CE";I
3210 Z=(AD(I)AND15):TP=15:BO=0:GOSUB9000
:B=Z:AD(I)=A*16+B
3215 PRINT"■■■■■■■■■■■■■DEFINE ENVELOPES"
3220 PRINT"■■■■■■■■■■■SUSTAIN     FOR VOI
CE";I
3230 Z=(SR(I)AND240)/16:TP=15:BO=0:GOSUB
9000:A=Z
3240 PRINT"■■■■■■■■■■■RELEASE     FOR VOI
CE";I
3250 Z=(SR(I)AND15):TP=15:BO=0:GOSUB9000
:B=Z:SR(I)=A*16+B
3260 PRINT"■":NEXT
3270 GOTO 2420          = EDITOR
```

Lines 3140-3270 Get ADSR values from user.

```
3280 REM  FILTER
3290 PRINT"■■■■■■■■■■■■■■■■■■■■DEFINE FILTE
RS"
3310 PRINT"■■■■■■■■ENTER VALUE FOR FILTER
 CUT OFF"
3330 Z=FI:TP=2047:BO=0:GOSUB9000:FI=Z
3350 PRINT"■■■■■■■■■■ENTER VALUE FOR RES
FILTER"
3370 Z=RS:TP=2047:BO=0:GOSUB9000:RS=Z
3390 RS=RS*16
3400 FV=0:FH=FIAND255:FL=FI/256AND7
```

Lines 3280-3400 Get values for filter cutoffs from user.

```
3410 WP=15:PRINT"■":FORI=0TO2
3420 PRINT"■■■■■■■■■■■■■■FILTER VOICE ";I
+1
3430 PRINT"■■■■■■■■■■■■■■[F1]=YES : [F3]=NO
"
3440 GETZ$:IFZ$=""THEN3440
3450 Z=ASC(Z$)-132
```

```
3460 IFZ=1ORZ=2THEN3480
3470 GOTO3440
3480 WP=WP+3:IFZ=1THENFV=FV+2↑I
3490 FORD=1TO500:NEXT:NEXT:FS=0:FV=FV+RS
```

Lines 3140-3490 Get voices to be filtered from user.

```
3500 PRINT"████████████LOW PASS FILTER"
3510 PRINT"█████████[F1]=YES : [F3]=NO"
3520 GETZ$:IFZ$=""THEN3520
3530 Z=ASC(Z$)-132:IFZ=1ORZ=2THEN3550
3540 GOTO3520
3550 IF Z=1THENFS=FSOR16
3560 FORD=1TO500:NEXT
```

Lines 3500-3560 Offer low pass filter.

```
3570 PRINT"███████████BAND PASS FILTER"
3580 PRINT"█████████[F1]=YES : [F3]=NO"
3590 GETZ$:IFZ$=""THEN3590
3600 Z=ASC(Z$)-132:IFZ=1ORZ=2THEN3620
3610 GOTO3590
3620 IF Z=1THENFS=FSOR32
3630 FORD=1TO500:NEXT
```

Lines 3570-3630 Offer band pass filter.

```
3640 PRINT"███████████HIGH PASS FILTER"
3650 PRINT"█████████[F1]=YES : [F3]=NO"
3655 FORD=1TO500:NEXT
3680 IF Z=1THENFS=FSOR64
3690 POKE54293,FL:POKE54294,FH:POKE54295
,FV
3700 GOTO 2420
```

Lines 3640-3700 Offer high pass filter.

```
3710 REM  TAPE
3715 SYS32927
3720 PRINT"█[F1] ENTER LOAD ROUTINE"
```

Lines 3710-3720 Restore interrupts ready for load or save routines.

```
3730 PRINT"[F3] ENTER SAVE ROUTINE"
3740 PRINT"[F5] RETURN TO EDITOR"
3750 GETZ$:IFZ$=""THEN3750
3760 Z=ASC(Z$)-132:IFZ=1ORZ=2ORZ=3THEN37
70
3770 IFZ=2THENGOTO4340
3780 IFZ=3THENGOTO2420
3785 POKE251,1
3786 PRINT"█████████LOAD FROM TAPE OR DI
SK (T/D)":GETZ$:IFZ$=""THEN3786
3787 IFZ$="T"THENLOAD"",1,1
3788 IFZ$<>"D"THEN3786
3789 INPUT"█████████FILE NAME";FI$
3790 LOADFI$,8,1
```

Lines 3730-3790 Load a music file from tape or disk.

```
3800 :
3810 REM  TEMPO
3820 PRINT"███████████CHANGE TEMPO OR OC
TAVE"
3830 PRINT"[F1] CHANGE TEMPO   [F3] CHAN
GE OCTAVE"
3840 GETZ$:IFZ$=""THEN3840
3850 Z=ASC(Z$)-132:IFZ=2THENGOTO3910
3860 IFZ<>1THEN3840
3880 PRINT"████████████████ENTER NEW TEMP
O "
3890 TP=100:BO=0:Z=DL:GOSUB9000:DL=Z
3900 GOTO2420
```

Lines 3800-3900 Get new tempo from user.

```
3910 REM OCTAVE
3920 FORI=1TO3:PRINT"▮▮▮▮▮▮▮▮▮▮▮VOICE ";
I
3930 PRINT"▮▮▮▮▮▮▮▮▮▮▮[F1] TOP FOUR OCTA
VES"
3940 PRINT"▮▮▮▮▮▮▮▮▮▮▮[F3] MIDDLE FOUR O
CTAVES"
3950 PRINT"▮▮▮▮▮▮▮▮▮▮▮[F5] BOTTOM FOUR O
CTAVES"
3970 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮PRESS REQUIRED
 KEY"
3980 GETZ$:IFZ$=""THEN3980
3990 Z=ASC(Z$)-132
4000 IFZ=1THENFK(I)=1
4010 IFZ=2THENFK(I)=4
4020 IFZ=3THENFK(I)=8
4030 FORD=1TO200:NEXT
4040 NEXT:GOTO2420
```

Lines 3910-4040 Get octave for each voice from user.

```
4050 REM  BAR
4060 PRINT"▮▮▮▮▮▮▮▮▮COPY BARS OR CHANGE
BAR"
4070 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮[F1] COPY BAR
S"
4080 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮[F3] CHANGE BAR"
4090 GETZ$:IFZ$=""THEN4090
4100 Z=ASC(Z$)-132:IFZ=1ORZ=2THEN4120
4110 GOTO4090
4120 IFZ=1THEN GOTO4190
4130 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮CHANGE  BAR"
4150 TP=80:BO=1:Z=HO:GOSUB9000:BN=Z-1
4160 LP=MW+(BN*V9)-V5:HO=BN+1:V=3:B6=B5:
Z1=1:N1=24
4170 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮PLEASE WAIT"
4180 GOSUB1640:GOTO2420
```

Lines 4050-4180 Change to new bar.

```
4190 REM  CBARS
4200 PRINT"▮▮▮▮▮▮▮▮▮▮COPY MUSIC FROM BAR
 "
4205 TP=80:BO=1:Z=1:GOSUB9000:FB=Z
4230 PRINT"▮▮▮COPY MUSIC UP▮TO AND INCLU
DING BAR"
4235 TP=80:BO=FB+1:Z=FB+1:GOSUB9000:LB=Z
:
4250 PRINT"▮▮▮▮▮▮▮▮▮▮COPY INTO FILE FROM
BAR "
4255 TP=80:BO=LB+1:Z=LB+1:GOSUB9000:CB=Z
:
4270 SB=(LB-FB+CB)*V9:HO=CB+LB-FB
4280 FB=MW+FB*V9-V9:LB=MW+LB*V9:CB=MW+CB
*V9-V9
4285 PRINT"▮▮▮▮▮▮▮▮COPYING FILE PLEASE W
AIT"
4290 FORI=FBTOLB:POKECB,PEEK(I):CB=CB+1:
NEXT
4300 :
4310 LP=MW+SB-V5:V=3:B6=B5:Z1=1
4330 GOSUB1640:GOTO2420
```

Lines 4190-4330 Copy bars from one part of the file to another.

```
4340 REM  SAV
4341 PRINT"▮▮▮▮▮▮SAVE TO TAPE OR DISK (T
/D)"
4342 GETZ$:IFZ$=""THEN4342
4350 PRINT"ENTER FILENAME (8 CHARS MAX)"
:INPUTFI$:PRINT"▮"
4360 FI$=LEFT$(FI$,8)
4370 FORI=1TOLEN(FI$)
4380 POKE 1023+I,ASC(MID$(FI$,I,1)):NEXT
4390 POKE183,LEN(FI$):POKE187,0:POKE188,
4:POKE185,1:POKE186,1
4395 IFZ$="D"THENPOKE186,8
4396 PP=PP+V5:FORI=PPTOPP+9:POKEI,255:NE
XT:PP=PP+9
```

Lines 4340-4396 Get filename for save routine and set up pointers (in page zero).

```
4400 POKE172,240:POKE173,79:POKE193,240:
POKE194,79:POKE175,INT(PP)/256
4410 POKE174,PPAND 255
4415 POKEMW-2,INT(PP)/256
4420 POKEMW-1,PPAND255:POKEMW-3,DL:POKEM
W-4,HP(1):POKEMW-5,LP(1)
4430 POKEMW-6,HP(2):POKEMW-7,LP(2):POKEM
W-8,HP(3):POKEMW-9,LP(3)
4440 POKEMW-10,AD(1):POKEMW-11,SR(2)
4450 POKEMW-12,AD(2):POKEMW-13,SR(2)
4460 POKEMW-14,AD(3):POKEMW-15,SR(3)
```

Lines 4400-4460 POKE variables for ADSR, pulse widths under music file.

```
4470 SYS62957
4475 PP=PP-12:FORI=0TO63:POKEM1+I,M2(I):
NEXT
4480 GOTO 2420
4490 :
```

Line 4470 Call Kernal saver routine.

```
4500 REM  INITIATE
4510 N1=24:S=50:Q=38:NP=103:BL=35:P4=N1+
1:V=1:C1=13:C2=12:L1=150:L2=180
4520 D(1)=1:D(2)=2:D(3)=3:D(4)=4:D(5)=6:
D(6)=8:D(7)=12:D(8)=16:MW=20480:V5=3
4530 PP=MW-V5:V2=1:V3=2:V4=16:V6=32:V7=4
8:HO=1:DL=20:NL=3:LP=PP:EP=PP
4540 FK(1)=4:FK(2)=4:FK(3)=4
```

Lines 4500-4540 Initiate variables.

```
4550 IF PEEK(251)<>0THENML=1:POKE251,0
```

Line 4550 Check to see if the program is rerunning after a file load.

```
4570 READA:IFA=-1THEN4590
4580 POKE32768+I,A:I=I+1:GOTO4570
```

Lines 4570-4580 POKE machine code into memory.

```
4590 SYS32907:SYS32768
```

Line 4590 Clear hires screen and colour memory.

```
4600 FORG=1TO9:README: FORI=0TO63:READA:
POKEME+I,A:NEXT:NEXT
4605 READM1:FORI=0TO63:READM2(I):POKEM1+
I,M2(I):NEXT
```

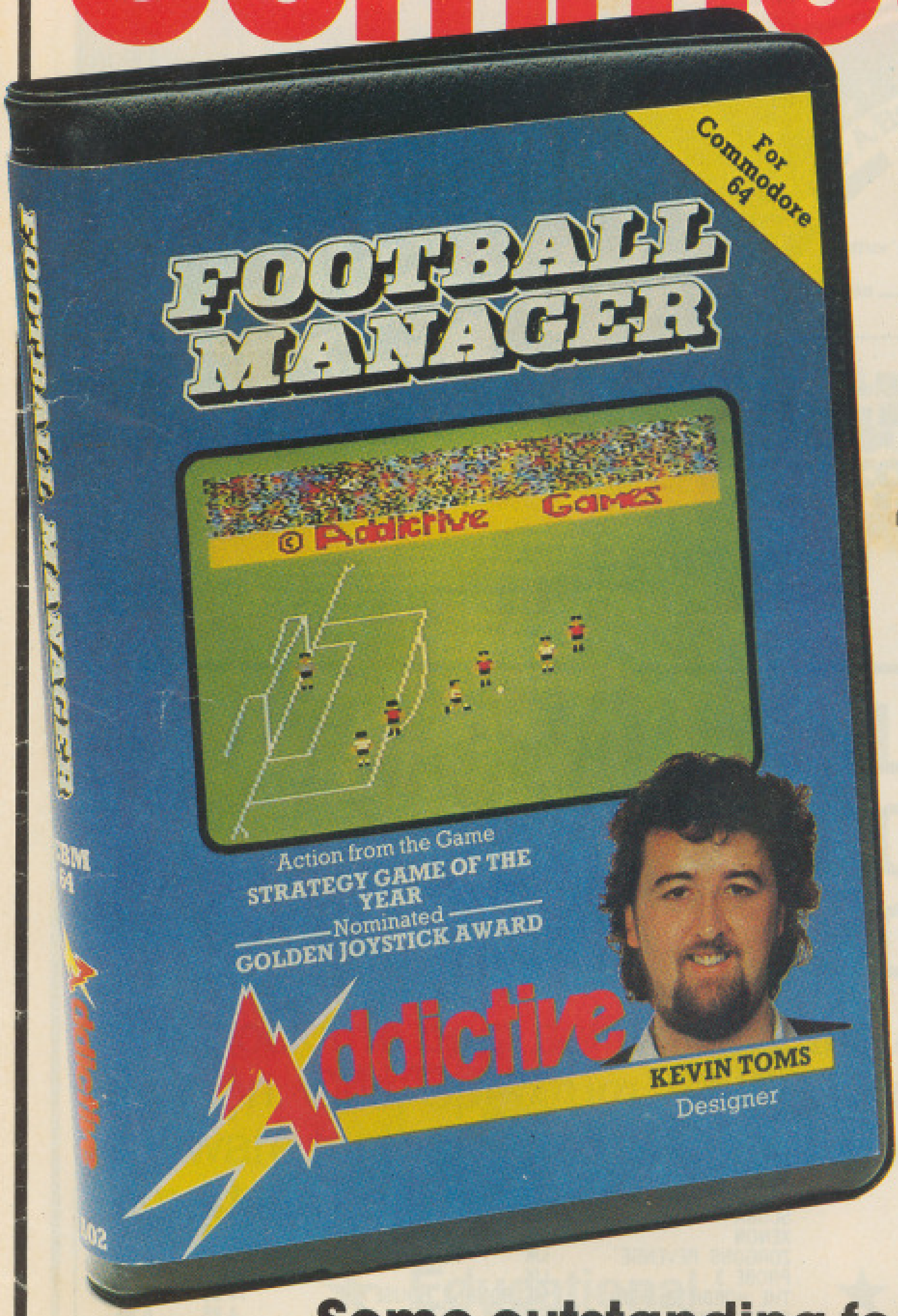
Lines 4600-4610 POKE sprite data into memory.

```
4610 FORI=1TO12:READN$(I),NV(I),NP(I)
```

Line 4610 Read music notes, values and position on sheet.

```
4620 N$(I+12)=N$(I):NV(I+12)=INT(NV(I)/2
):NP(I+12)=NP(I)+14
4630 N$(I+24)=N$(I):NV(I+24)=INT(NV(I+12
)/2):NP(I+24)=NP(I)+28
```

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```
4640 N$(I+36)=N$(I):NV(I+36)=INT(NV(I+24
)/2) :NP(I+36)=NP(I)+42
4650 N$(I+48)=N$(I):NV(I+48)=INT(NV(I+36
)/2):NP(I+48)=NP(I)+56:NEXT
4660 X=58:FORI=1TO24
4670 IFI=6ORI=13ORI=18THENX=X+8
4680 X=X+8:X4(I)=X:NEXT
```

Lines 4620-4680 Calculate values for all octaves.

```
4690 FORI=1TO12:READY4(I):Y4(I+12)=Y4(I)
:NEXT
```

Line 4690 Read position of notes for keyboard.

```
4740 A$(1)="5555688886555566666666575757
57222868686"
4750 A$(2)="5555688886555566666666575757
57"
4760 A$(3)="5555688886555566666666575757
5722233555220888"
4770 A$(4)="55556888865555666666666"
4780 A$(5)="5555688886555566666666000222
222255220888"
4790 A$(6)="5555666888877700006666666666
"
4800 A$(7)="5555666888877700006666666666
000222222255220888"
4810 A$(8)="555556568656888887875787"
4820 GOSUB5050:GOSUB5440:GOSUB5080:GOSUB
5200
```

Lines 4740-4810 Strings for draw routine.

```
4840 PRINT"███████████████BEATS TO THE BA
R"
4850 PRINT"███████████[F1] = 3/4    [F3]
= 4/4":POKE198,0
4860 GETZ$:IFZ$=""THEN4860
4870 BB=ASC(Z$):IFBB=133ORBB=134THEN4890
4880 GOTO4860
```

Lines 4840-4880 Get beats-to-the-bar from user.

```
4890 IF BB=134THENBB=6.25:B5=16:B6=B5:B8
=49:B7=54:V9=144
4900 IF BB=133THENBB=8.34:B5=12:B6=B5:B8
=49:B7=50:V9=108
4910 PRINT"█"
4920 IFML=1THENGOSUB4940
4930 RETURN
```

Lines 4890-4900 Calculate the distance the sprite will move on the music sheet.

```
4940 REM LOAD
4945 PP=PEEK(MW-1)+256*PEEK(MW-2)
4950 DL=PEEK(MW-3):HP(1)=PEEK(MW-4):LP(1
)=PEEK(MW-5)
4960 HP(2)=PEEK(MW-6):LP(2)=PEEK(MW-7)
4970 HP(3)=PEEK(MW-8):LP(3)=PEEK(MW-9)
4990 AD(1)=PEEK(MW-10):SR(1)=PEEK(MW-11)
5010 AD(2)=PEEK(MW-12):SR(2)=PEEK(MW-13)
5030 AD(3)=PEEK(MW-14):SR(3)=PEEK(MW-15)
5034 PP=PP-12:LP=PP:EP=PP
5035 HO=INT((PP+V5-MW)/144)+1
5040 RETURN
```

Lines 4940-5040 Get values for ADSR and pulse if a music file has just been loaded.

```
5050 POKE198,0:PRINT"████████████████PRE
SS ANY KEY"
5060 GETZ$:IFZ$=""THEN5060
5070 RETURN
5080 REM  PREDEFINED
5090 SID=54272
5120 AD(1)=15:SR(1)=0:AD(2)=15:SR(2)=0:A
D(3)=15:SR(3)=0
5130 HP(1)=1:LP(1)=50:HP(2)=5:LP(2)=130
5140 VV(1)=33:VV(2)=33:VV(3)=33
5150 RETURN
5190 REM  SHEET
5200 FORI=63120TO63127:POKEI,129:POKEI+1
04,64:POKEI+200,16:POKEI+296,1
5210 POKEI+320,129:POKEI+424,64:POKEI+52
0,16:POKEI+616,1:NEXT
5220 FORI=64080TO64087:POKEI,129:POKEI+1
04,64:POKEI+200,16:POKEI+296,1
5230 POKEI+320,129:POKEI+424,64:POKEI+52
0,16:POKEI+616,1:NEXT
5240 FORI=63123-320TO63423-320STEP8:POKE
I,240:POKEI+4,255:POKEI+320,255
5250 POKEI+640,255:POKEI+324,255:POKEI+6
44,255:NEXT
5260 FORI=64083-320TO64383-320STEP8:POKE
I,240:POKEI+4,255:POKEI+320,255
5270 POKEI+640,255:POKEI+324,255:POKEI+6
44,255
5280 POKEI+960,240:POKEI+964,240:NEXT
5290 RETURN
```

Lines 5200-5290 Draw music sheet on hires screen.

```
5300 REM  PAGE1
5310 PRINT"█████████████████████WELCOME TO"
5320 PRINT"██████████MULTI-VOICE ASSEMBL
ER"
5330 PRINT:PRINT"  █WITH THIS PROGRAM YO
U CAN COPY SHEET    MUSIC INTO YOUR ";
5340 PRINT"COMMODORE 64 COMPUTER"
5350 PRINT:PRINT" YOU HAVE THE OPTION OF
 4/4 OR 3/4 TIME"
5360 PRINT:PRINT"  NOTES ARE ENTERED WIT
H THE USE OF A "
5370 PRINT"  JOYSTICK IN PORT TWO OF THE
 COMPUTER"
5380 PRINT:PRINT"  SELECTION OF EDITOR O
PTIONS ARE MADE"
5390 PRINT"   WITH THE USE OF THE FUNCTI
ON KEYS"
5400 PRINT"                [F1]-[F8]"
5410 PRINT" (EVEN NUMBERS ARE SELECTED B
Y PRESSING"
5420 PRINT" 'SHIFT'AND THEN THE REQUIRED
 [F] KEY)"
5430 RETURN
5440 REM  PAGE2
5450 PRINT"██ █MUSIC IS ENTERED THREE BA
RS AT A TIME"
5460 PRINT"FIRST VOICE '1' FOR THE FIRST
 THREE BARS";
5470 PRINT"THE PROGRAM THEN JUMPS BACK T
O THE FIRST";
5480 PRINT"BAR FOR VOICE '2' THEN VOICE
'3'"
5490 PRINT"██AFTER ALL THREE VOICES HAVE
 BEEN DONE"
5500 PRINT"THE MUSIC SHEET IS CLEARED AN
D ADVANCED"
5510 PRINT"TO THE NEXT THREE BARS UNTIL
ALL THE"
```

```
5520 PRINT"MUSIC HAS BEEN ENTERED"
5530 PRINT:PRINT"THE EDITOR MAY BE ENTER
ED AT ANY TIME"
5540 PRINT"BY PRESSING ANY KEY ON THE KE
YBOARD"
5550 PRINT:PRINT"HAPPY COMPOSING........
.ROB CHRISTER"
5560 RETURN
```

Lines 5300-5560 Intro pages.

```
5570 DATA169,0,133,252,133,251,198,252,1
98,251,160,0,169,0
5580 DATA145,251,198,251,208,250,145,251
,165,252,201,224,208,234,96
5590 DATA120,169,52,141,20,3,169,128,141
,21,3,169,129
5600 DATA141,26,208,169,127,141,13,220,8
8,96,169,1,141,25
5610 DATA208,173,18,208,48,39,169,63,141
,2,221,173,0,221
5620 DATA41,252,169,151,141,0,221,169,21
,141,24,208,173,17
5630 DATA208,169,27,141,17,208,162,154,1
42,18,208,76,188,254
5640 DATA76,49,234,169,63,141,2,221,169,
148,141,0,221,169
5650 DATA13,141,24,208,169,59,141,17,208
,162,1,142,18,208
5660 DATA173,13,220,41,1,240,3,76,49,234
,76,188,254,169
5670 DATA12,162,0,157,0,192,157,0,193,15
7,0,194,157,0
5680 DATA195,202,208,241,96
5681 DATA120,169,49,141,20,3,169,234,141
,21,3,169,0,141,26,208
5682 DATA169,129,141,13,220,169,63,141,2
,221,169,151,141,0
5683 DATA221,169,21,141,24,208,173,17,20
8,41,223,141,17,208
5684 DATA88,96
5685 DATA120,165,1,41,253,133,1,162,0,18
9,0,254,141,228
5686 DATA128,165,1,9,2,133,1,88,96,-1
```

Lines 5570-5686 Data for machine code.

```
5690 DATA51392,,,,,,,,,,,,,,,,,,,,,,,12,
,,10,,,9,,,12,128,,10,,,9,,,8,,,8,,,8
5700 DATA,,248,,1,248,,,248,,,,,,,,
5710 DATA51456,,,,,,,,,,,,,,,,,,,,,,,12,
,,10,,,9,,,8,128,,8,,,8,,,8,,,8,,,8
5720 DATA,,248,,1,248,,,248,,,,,,,,
5730 DATA51520,,,,,,,,,,,,,,,,,,,,,,,12,
,,10,,,9,,,8,128,,8,,,8,,,8,,,8,,,9,128
5740 DATA,248,,1,249,128,,248,,,,,,,,
5750 DATA51584,,,,,,,,,,,,,,,,,,,,,,,8,,
,8,,,8,,,8,,,8,,,8,,,8,,,8,,,8,,,248
5760 DATA,1,248,,,248,,,,,,,
5770 DATA51648,,,,,,,,,,,,,,,,,,,,,,,8,,
,8,,,8,,,8,,,8,,,8,,,8,,,8,,,9,128,,248
5780 DATA,1,249,128,,248,,,,,,,
5790 DATA51712,,,,,,,,,,,,,,,,,,,,,,,8,,
,8,,,8,,,8,,,8,,,8,,,8,,,8,,,248,,1,8
5800 DATA,1,8,,,248,,,,,,,
5810 DATA51776,,,,,,,,,,,,,,,,,,,,,,,8,,
,8,,,8,,,8,,,8,,,8,,,8,,,8,,,249,128,1,8
5820 DATA,1,9,128,,248,,,,,,,
5830 DATA51840,,,,,,,,,,,,,,,,,,,,,,,,,,
```

```
,,,,,,,,,,,,,,,,,,,,,,,252,,1,134,,1
5840 DATA134,,1,134,,,252,,,,,
5850 DATA51904,,,,,,,,31,128,,24,192,,24
,192,,31,128,,28,,,27,,,25,128
5860 DATA,25,128,,25,128,,,,,,,,,,,,,,,
,,,,,,,,,,,,,,,
5870 DATA832,,,,,,,,32,,,32,,,112,,1,252
,,15,255,128,1,252,,,112,,,32
5880 DATA,,32,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,
5890 DATAB,64814,170
```

Lines 5690-5880 Data for sprites.

```
5900 DATAA#,61176,172,A,57743,172,G#,545
02,174
5910 DATAG,51443,174,F#,48556,176,F,4583
0,176
5920 DATAE,43258,178,D#,40830,180,D,3853
9,180
5930 DATAC#,36376,182,C,34334,182
```

Lines 5900-5930 Data for notes and values.

```
5940 DATA130,110,130,110,130,130,110,130
,110,130,110,130
```

Line 5940 Data for position of sprite on keyboard.

```
7000 POKE53269,0:T=0:U=0:FORI=1TOLEN(A$(
BL-34))
7010 VU=ASC(MID$(A$(BL-34),I,1))-48
7020 GOSUB8000:NEXT:POKE53269,255:RETURN
8000 IFVU=0THENT=T+1:VP=1
8010 IFVU=1THENU=U-1:VP=1
8020 IFVU=2THENU=U+1:VP=1
8030 IFVU=3THENT=T-1:VP=1
8035 IFVU=5THENT=T+1:VP=0
8040 IFVU=6THENU=U-1:VP=0
8050 IFVU=7THENU=U+1:VP=0
8060 IFVU=8THENT=T-1:VP=0
```

Lines 7000-8060 Get position of byte from string.

```
8065 IFVP=1THENRETURN
8080 Z=T+(Q-32):Z2=U+(NP(N1)-176):CH=INT
(Z/8):RO=INT(Z2/8)
8090 LN=Z2AND7
8100 BY=63120+RO*320+8*CH+LN
8105 POKE32984,INT(BY/256):POKE32983,BY-
INT(BY/256)*256
8106 SYS32973:BI=7-(ZAND7):POKEBY,PEEK(3
2996)OR(2↑BI):RETURN
```

Lines 8080-9000 Plot dots on hires screen to draw notes.

```
9000 REM
9010 IFK=4THENZ=Z+1:IFZ>TPTHENZ=BO
9020 IFK=5THENZ=Z-1:IFZ<BOTHENZ=TP
9025 PRINT"███████████[F1] INCREASE VALU
E"
9026 PRINT"███████████[F3] DECREASE VALUE
"
9027 PRINT"███████████[RETURN]- ENTER VALU
E"
9030 PRINT"███████████PRESENT SETTING
    ███████"Z"
9034 K=PEEK(197)
9035 IFK=1THENPOKE198,0:RETURN
9040 PRINT"██████";:GOTO9010
```

Lines 9000-9040 This routine is called by most routines. It gets a value from the user.

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■CBM 64 software to swap. Phone Robert Andrews on Northampton 402750 after 6pm Mon-Fri, all day weekends.

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■Exchange Level 9 Lords of Time (with maps, clue sheet) for level 9 Colossal Adventure or Snowball. Ring T. Burke on Sheffield 367158.

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■1525 printer-plotter, also swap software titles, some American, all disk. Also have 2230 Data Products drum printer to swap for 1701 monitor or plotter. Write: John, 85 Dalcross Court, Middlesborough.

■Fall of Rome. Will exchange for Space Shuttle by Microdeal or 20th Century History Package. DL Thomas, Llanelli 58566 or write: 30 Hilltop, Swiss Valley Park, Llanelli, Dyfed SA14 8DF.

CLUBS & EVENTS

■Independent Commodore Products Users Group No. RG114, meets 1st Friday of every month at Bury House, Bury Road, Gosport, Hants at 7.30pm sharp. New members welcomed.

MESSAGES

■Authors: enthusiastic learner seeks CMD 64 book which is comprehensive throughout. If you know of or are writing such a novelty please contact John Bond on Bridport (Dorset) 24751. Thanks.

■All the best to the most recent pupils of 3L, Latymer Upper School. A special hallo to Mum, Dad and Nataly. Alen.

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Talent Computer Systems is a software house comprising two computer science lecturers, the former publicity officer of the Scottish Ballet and the University of Strathclyde. Together, they've launched themselves into the home computer market with six products — four of them for the 64. Intrigued, Surya *decided to pay the company a visit ...*

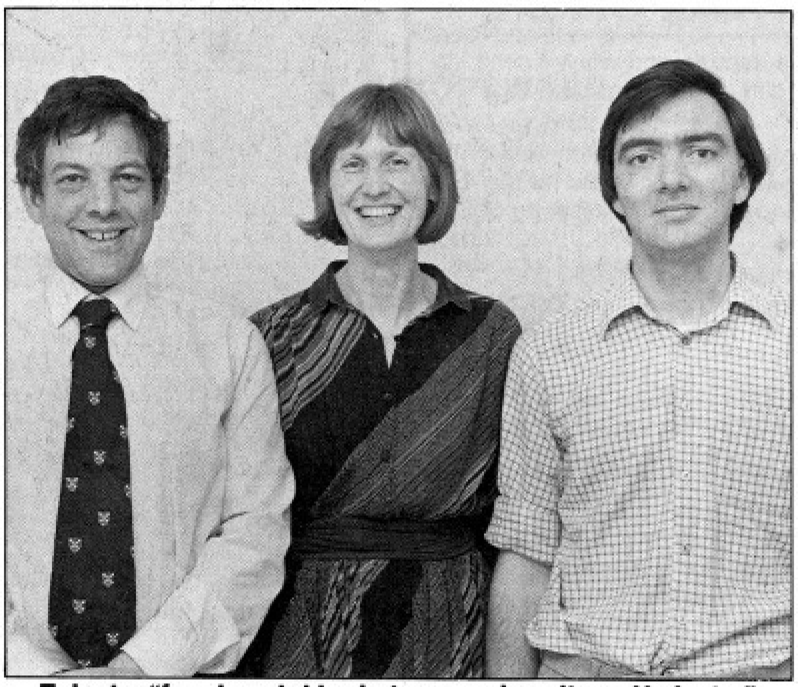
Talent Computer Systems is housed in a redbrick building close to the centre of Glasgow ("it's a building the university had forgotten it owned"). Most of Talent's officers are housed in huts within the partially completed ground floor: the place is temporary and looks it ("the university offered us a cellar, but we wanted windows").

The company was the brainchild of Professor Andrew Colin, former head of the computer science department at Strathclyde University in Glasgow. Colin saw an industry in need of creative expertise, and a ready supply of computing talent at the university: Talent was incorporated to put one in touch with the other. A partnership was formed between Colin, Dr Jon Malone — a colleague at the university computer science department — and Colin's wife, Veronica. The fourth partner in the company is the university itself. I asked Professor Colin what gave them the idea:

"Talent was started about a year ago with the idea of forming a bridge between the university and industry. I've long had an interest in commerce; some academics frown on involvement with industry, but this attitude is quite wrong. Universities need money in order to survive, and industry is their bread-and-butter. The university supplied the premises, heat, light and so on, in return for 25 per cent of the profits — if any, of course."

Professor Colin is in his forties, stockily-built with a ready and slightly mischievous smile. He had mentioned that some academics disliked commerce — the victorian idea that research is pure and trade is dirty. Had it been difficult selling the idea to the university?

"No, not at all. I took the idea to the principal, said 'here's what I want to do' and Strathclyde said 'yes'. I think universities are becoming very keen on this sort of thing, partly because they have to be — the money comes in useful — and partly because universities are moving towards involvement with industry generally.



Talent — "forming a bridge between university and industry" Professor Andrew Colin, Veronica Colin, Dr Jon Malone.

You might expect to find a university involved in the development of expert systems or something equally respectable, but games? "We're very much aware of the importance of not being a one-product company — or even dealing in just one type of product. We've found the games market much more difficult than we had expected, we were very naive to begin with. We thought we'd have a couple of chaps beavering away through the summer, have our stock by September and make our fortune by Christmas. That didn't work!"

Talent writes most of its software on large systems in a language called Stab, developed by Colin ten years ago. "Stab is very much in the spirit of BCPL, but much smaller.

"The advantage of Stab is that it offers both interpreted and compiled options. You can specify, procedure by procedure whether you want the section to be compiled or interpreted, so we get the best of both worlds."

Talent concentrated on the 64 for its first releases because of the large memory and the excellent sound facilities. Having played two of the Talent games, I can confirm that Talent puts those facilities to very good use: in *Kalah*, a rendition is given of the entire first movement of *Italian Sonata*! Professor Colin recalls someone telling him that a genius must have been responsible for programming the music in the games: "Yes, I said. His name is Bach."

Is Talent going to be producing hardware add-ons? Various mutterings between Colin and Malone ("Yes indeed — Can we talk about ...?" "That's under patent by ..." "Oh, yes." "We'd better not say anything other than that it exists — even that's not supposed to be disclosed. I'm sorry, no comment." "Except that we do do hardware work for people". I see...

What of future 64 software? "We're working on a number of new packages which we hope to release in the autumn. One of these is a wordgame, but it's not Scrabble. It's based on the 'penny cascade' things you see in amusement arcades, except that the pennies are replaced by letters. You have to put new letters in to form words. It's more complicated than it sounds — you can work to defeat your opponents as well as increasing your own score.

Veronica: "Another is a business simulation. Because I've had a lot of experience in the theatre, we're working in conjunction with the manager of the Theatre Royal in Glasgow to produce a game called *Empressario*. You have to keep your theatre open and you've got control over selling tickets, advertising and so on — but things do go wrong! All the events in the game — the orchestra walking out because you've appointed a lady clarinettist, for example — are all taken from real life. Every one is true! Well, almost ... The program is in prototype form at present and it'll be one of our next products.

Does Talent feel that its expertise is being put to good use, producing games, advertising systems and so on? Veronica Colin clearly does: "Yes, it probably is. Ok, the end use is trivial, but the techniques and tools we're creating to write games will stand us in enormously good stead for other things. The main purpose is writing things like *Microplex* (a 64 program to create animated text displays for use in shop windows) is to raise capital to do more interesting things.

Talent has decided not to develop anything for military applications ("except in times of war," adds Malone). Does this non-military stance extend to not producing aggressive games? Professor Colin: "Hmmm ... an interesting question. We certainly wouldn't want to do anything to encourage violence, but it could be said that aggressive games in fact dissipate violence. I think the most likely explanation for what actually happens in an invaders game is that the aliens normally live in a different dimension, are starving, and come here looking for food. What the player is actually shooting at the aliens is food parcels. And, of course, as soon as an alien reaches out and grabs a food parcel, it disappears back into its own dimension." Ah, now why didn't I think of that?